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INSTITUTE FOR DEFENSE ANALYSES

Reciprocal Certification Agreements for DoD

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Karen J. Richter, Project Leader

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PREFACE

This paper documents the work performed by the Institute for Defense Analyses (IDA) on the task entitled "Reciprocal Agreements Among Certification Programs." The work was sponsored by the Office of the Director, Test, Systems Engineering, and Evaluation (DTSE&E).

The authors wish to thank the reviewers, Dr. David Graham of IDA and Maureen Breitenberg of the National Institute for Standards and Technology (NIST) for their insightful comments. Bob Schmidt and Dick Kane of the Defense Contract Management Command (DCMC) and Pete Angiola and Merrill Yee of DTSE&E also provided useful comments on the draft document. Richard Villeneuve from GenCorp Aerojet and Nancy Beckwith from Electric Boat Corp. provided information on the Coordinating Agency for Supplier Evaluations (C.A.S.E.) organization. Arshad Hafeez from the Performance Review Institute (PRI) provided information on the National Aerospace and Defense Contractors Accreditation Program (NADCAP). Ed Kozak of the IIT Research Institute was also kind enough to supply the Common Quality Certification System report.

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SUMMARY

This report examines the benefits of reciprocal agreements for assessing suppliers' quality management systems and considers how DoD can reduce costs by eliminating redundant audits of such systems.

BACKGROUND

Supplier oversight processes entail significant expense for both industry and DoD. Best commercial practice seeks to reduce this expense through stringent evaluations of suppliers' quality system effectiveness, followed by reduced oversight and long-term partnering. Suppliers that meet evaluation criteria gain the status of "preferred" or "certified."

Currently, companies face the potential that their product and process quality will undergo numerous audits and certifications by various industry bodies as well as government customers. Audits are required to achieve preferred supplier status and Malcolm Baldrige finalist status, and to qualify for such programs as the Army's Contractor Performance Certification Program (CP)², Boeing's D1-9000 certification, the Big 3 Automaker's QS-9000 certification, and ISO 9000 registration and qualification. But because there is no universal reciprocal acceptance among the various industry associations and government agencies, the savings from reduced oversight and the elimination of redundant audits and assessments are only partially realized by both the customers and the suppliers.

IDA was tasked to determine how DoD can enter into reciprocal agreements with industry quality system assessment bodies and other government agencies to reduce DoD's own oversight resource requirements.

IDA APPROACH

IDA first defined the numerous terms used in this area of study. The terms are not consistently used, and this was a problem we had to overcome throughout the study. We described and compared several quality system assessment programs and quality award programs to see their differences and similarities. We used ISO 9000 or its U.S.

equivalent, ANSI/ASQ Q9000, as the baseline for quality system assessment programs and the Malcolm Baldrige National Quality Award as the baseline for the quality award programs. We examined the process, auditor requirements, and results. Chapters II and III contain the analysis of these programs. In the course of our study, we found that some elements of past performance programs, such as their information collection requirements, could pertain to our consideration of reciprocal agreements and decided to examine some past performance programs as well. Past performance programs are described in Chapter IV. We reviewed a report on the feasibility of a common quality certification system within the precision gear industry and contacted existing industry organizations fostering reciprocal agreements. Descriptions of the report and the reciprocal organizations are in Chapter V. Current DoD policy is also outlined in Chapter V. Chapter VI concludes the report with summary recommendations.

STUDY RESULTS

There are many reasons why a supplier would want to win an award or become certified or registered to a standard. Foremost is the prospect of increased business opportunities. Most qualification programs work as thresholds—either the supplier meets the standard of the program required by the customer or the supplier doesn't do business with that customer. The prestige that comes with winning a quality award also usually results in new business in the commercial sector. For defense contracts, audits by DCMC to determine that the supplier meets an ISO-like system tailored to the needs of the contract are required. New acquisition rules now let DoD buying authorities consider the past performance of a contractor—quality, schedule, and cost performance—in source selection.

The problems with audits for a supplier come when different customers require different types of audits under different types of certification/registration/accreditation programs. Many of these audits are similar in nature and content, as illustrated by our comparison tables in Chapters II and III. Similarity among programs is a result of using the 20 elements of the ISO 9000 standards as their basis. But each audit costs the supplier and the customer substantial amounts of time and money. Data we collected

shows that ISO 9000 registration alone can cost a company as much as \$30,000 initially and up to \$5,000 every 6 months for reassessment to maintain the registration.¹

Shared data bases and reciprocal agreements among companies in formal organizations such as the Coordinating Agency for Supplier Evaluations (C.A.S.E.) and the National Aerospace and Defense Contractors Accreditation Program (NADCAP) have saved their member companies both time and money. One C.A.S.E.-member company reports that it saves an average of 100 audit surveys per year. Each survey entails about 32 hours of labor and travel cost, which works out on average to \$5,000 per survey. A large prime contractor company reports net savings of \$1.6 million per year due to its NADCAP membership. Another prime reports savings of over 200 audits per year. NADCAP supplier companies report savings of about 40% fewer audits per year. Their business volume has increased \$750,000 to \$2 million.

Despite such reported savings, trust remains an issue for most primes—they prefer to do their own quality system audits rather than rely on those done by one of their competitors, and they worry about the legal repercussions of sharing their audit results of suppliers with other customers. C.A.S.E. members determined that their organization presents no legal liability, as demonstrated by the fact that it has operated for over 30 years without successful legal challenges. The trick is to have an arrangement whereby the participating original equipment manufacturers (OEMs) agree on the processes for the audits, the auditor qualifications, and the criteria for the audits (usually based on ISO-9000 with some sector-specific additions). Then the contractors can share nonprejudicial data on the process, completion, and pass-fail results of the audit without worrying about legal repercussions of sharing the actual audit results. This is the procedure C.A.S.E. uses and it has been lawsuit-free since its inception in 1964. C.A.S.E. was formed when several prime contractors, who shared many of the same suppliers, banded together to derive a process whereby they could reduce the number of audits and assessments they had to perform on their suppliers.

DCMC encourages and benefits from the audit work of industry organizations such as C.A.S.E. and NADCAP because DCMC can often rely on their audit reports, thereby reducing or eliminating the need for a DCMC audit. To date, however, membership in these organizations is not yet widespread across all industry sectors.

¹ Steven M. Terronez, "The Contractor Performance Certification Program," *Army RD&A*, Sept-Oct 1997.

DCMC manages more than 360,000 prime contracts worth more than \$900 billion at more than 23,000 contractors throughout the world. Any substantial gains to the government from a relationship with these industry organizations is, therefore, hindered by their currently limited size and scope.

RECOMMENDATIONS

To reduce the time and cost of quality system audits, DoD would do well to make use of as much industry data and as many industry programs as possible. This has been DCMC policy since November 1996, and we recommend that DoD continue along this path. Because DoD cannot recommend one industry program over another, industry must make the determination of which reciprocal organization meets its needs. Since trust is best built among customers who share similar products, these organizations, or divisions and sections within the organizations, should be built around industry sectors, as the sections of C.A.S.E. and NADCAP are. Since DCMC deals with thousands of products that do not currently have reciprocal agreements and organizations within their sectors, its only option is to do its own audits under the current policy of using any other audit information available from the supplier. DoD would do well to encourage the defense and commercial industry to look at the benefits of forming reciprocal relationships for their quality audits. When such arrangements become best commercial practice, DoD can make full use of them. As with other processes under the Single Process Initiative, the greatest benefit comes when streamlining practices not only affect prime contractors but also pervade the supplier base. We repeat here the recommendations of the gear industry report on the Common Quality Certification System (CQCS):

Finally, for a CQCS to be truly successful, it must be applicable at all supplier levels. Therefore, primes need to undertake efforts to reduce the redundancies and foster reciprocity in the auditing and certification of their own suppliers. Also, the primes need to agree on criteria and encourage reciprocity in the audit and certification of their suppliers, otherwise, a CQCS will provide inconsistent benefits to the industry as a whole.

I. INTRODUCTION

Supplier oversight processes entail significant expense for both industry and DoD. Best commercial practice seeks to reduce this expense through stringent evaluations of suppliers' quality system effectiveness, followed by reduced oversight and long-term partnering. Suppliers that meet evaluation criteria gain the status of "preferred" or "certified."

Currently, companies face the potential that their product and process quality will undergo numerous audits and certifications by various industry bodies as well as government customers. Audits are required to achieve preferred supplier status and Malcolm Baldrige finalist status, and to qualify for such programs as the Army's Contractor Performance Certification Program (CP)², Boeing's D1-9000 certification, the Big 3 Automaker's QS-9000 certification, and ISO 9000 registration and qualification. But because there is no universal reciprocal acceptance among the various industry associations and government agencies, the savings from reduced oversight and the elimination of redundant audits and assessments are only partially realized by both the customers and the suppliers.

A. OBJECTIVE AND STATEMENT OF WORK

IDA was tasked to determine how DoD can enter into reciprocal agreements with industry quality system assessment bodies and other government agencies to reduce DoD's own oversight resource requirements. A particularly noticeable impact is expected on the subcontractor tiers, where reciprocity, spanning primes and government buying activities, can significantly accelerate the Single Process Initiative efforts among subtiers.

During this project IDA was to—

- Develop descriptions and comparisons of all the various quality system assessment programs and determine how to evaluate equivalence. Consider the following key areas:
 - Process Management—how is the process controlled to be consistent, stable, and respected?

- Auditor Qualification—what are the training, skill, and experience criteria for the auditors?
- Assessment Criteria—what measures, ratings, or maturity indices are used to give a passing grade, as well as any further requirements for the retention of the certification or registration (periodic reevaluations, continuous improvement plans, etc.)?
- Analyze the options for entering into a reciprocal agreement, influencing the continued validity of a certification program, and terminating agreements if the program fails to live up to expectations.
- Discuss how DoD can increase efficiency through reduced oversight.

B. KEY CONCEPTS

Many terms used throughout this paper need to be defined and explained because their use varies, even within the quality assurance community. In general, these terms relate to customers' acceptance of quality system evaluations conducted by certification or registration bodies as a means to streamline the resources required for contract monitoring. More specifically, they indicate the type of acceptance, means of acceptance, and degree of acceptance.

1. Types of Acceptance

The term *certified* usually applies to a product or service of a supplier that is found to be in compliance with a certain standard. In her paper *The ABC's of Certification Activities in the United States*, Maureen Breitenberg of the National Institute of Standards and Technology (NIST) defines a certification program or scheme as “the procedure by which written assurance is given that a product or service conforms to a standard or specification.” She concedes, however, that many other terms exist and are in use by various organizations to define the same thing.

In the same vein, Breitenberg says, quality system *registration*, which involves the assessment and periodic audit of the effectiveness of a supplier's quality system, is often misnamed quality system *certification*. A supplier can register a quality system with an organization that conducts a registration program without participating in a product certification program.

Certification/registration bodies exist for all kinds of processes and systems. One data source, a NIST publication, is a compendium of industrial certification bodies. This

report concentrates on quality system registration, although reference is made to other processes for certification.

The Defense Contract Management Command (DCMC) uses the term *qualified* to mean that the contractor satisfies the appropriate elements of ISO 9000 but may not be registered (or certified) to the standard.

2. Means of Acceptance

First party audit—an audit that an organization conducts on its own systems. These self-audits are performed by the organization's own staff.

Second party audit—an audit that one organization performs on another with which the auditing organization either has, or intends to enter into, a contract to purchase goods or services. These audits can be carried out by the purchasing organization or an outside agency under contract or agreement with the purchasing organization.

Third party audit—an audit that a third party agency (a body not controlled by or under the influence of the customer or supplier) performs to determine whether a product or service complies with an industrial, national, or international standard. The audit could, in turn, be used to assure current and prospective customers of the product or service.

Third party audits bring up the issue of who will approve the registrar. The American Society for Quality (ASQ)¹ addressed this problem by instituting the Registration Accreditation Board (RAB) to certify auditors and accredit registrars to conduct ISO 9000 and ANSI/ASQC Q9000 registrations. RAB subsequently became independent of ASQ and joined with the American National Standards Institute (ANSI) to operate the U.S. National Accreditation Program (NAP) for the accreditation of registrars. RAB independently certifies auditors.

3. Degree of Acceptance

Recognition² is a concept whereby a potential customer obtains and gives credence to the results of second or third party audits and assessments. With some

¹ The American Society for Quality (ASQ) was formerly known as the American Society for Quality Control (ASQC).

² Recognition is used here to mean "acknowledgement or special notice and attention," not the formal legal sense of international standardization recognition arrangements.

understanding of how the results were gathered and how the auditor used them, a potential customer may be able to forgo a full set of new audits. But the supplier must be willing to offer the information and the customer willing to give it credence. How much credence depends on how well the information satisfies the customer's needs.

Reciprocity is a concept whereby a pair or group of potential customers agree to completely accept one another's or third party audits. That is, the customer accepts not only the audit results, but also the process by which they were obtained, including the qualifications of the auditors performing the audit. For example, if the Army's Contractor Performance Certification Program (CP)² and the automakers' QS-9000 program had a reciprocal agreement, they would accept each other's supplier registration. In this instance, the supplier's participation in QS-9000 and registered status offer a streamlining opportunity to the Army (CP)² program rather than merely the products of a single audit. One can see these types of agreements are important in dealing with products that have to be standardized for interoperable use.

Reciprocity can be exercised bilaterally or multilaterally, but multilateral agreements offer a greater, long-term opportunity for efficiency—all parties are then motivated to operate in a mutually beneficial manner. For example, mutual recognition by several primes of each other's audit results can greatly reduce audits of subcontractors. Memorandums of understanding between the automobile and the aerospace programs would help ensure that the programs remain synchronized to the maximum extent possible, and that all common suppliers only have to work with a single process. Such bilateral and multilateral agreements are uncommon, however. Nevertheless, decisions by customers to accept certification results from two or more programs can work to great advantage. The basis for making the decisions is the same.

C. EXAMPLES OF RECIPROCITY

Reciprocal certification schemes are often used between countries or states. The European Union (EU), for example, has established a mutual recognition approach for accepting certifications of regulated products that is in line with its goal of identifying approaches to the "technical harmonization of standards." Each EU member state determines who is competent to perform conformity assessments and presents a list of certifiers to the EU Commission. EU members are required to determine that the certifiers recommended for inclusion on the EU Commission's certifier list meet the criteria contained in the EN 45000 series. These certifiers are called upon to assess and

certify that products meet established requirement criteria. Once a listed certifier adjudges a product acceptable, whether through certification or other approval marking, the product is to be considered adequately certified by all EU member countries.³

Certifications with varying degrees of reciprocity also apply to lawyers, teachers, physician organizations, and women business owners. Examples of their recognition and reciprocity experiences are as follows. Descriptions are summarized from source material listed in Appendix D.

Lawyers. At present, members of the legal profession remain certified on the local or state level. Each of these jurisdictions administers its own comprehensive exam that individuals must pass in order to practice law in that state. Successful completion of this exam certifies an individual's competency for legal general practice. Increased mobility of the society and trends toward increased specialization in the workforce have led some in the legal field to advocate developing a national legal certification series to certify that individuals who pass an exam or exams are proficient in general law and/or additional legal specializations, regardless of state jurisdictions.

Teachers. Teachers in the United States are certified at the state level, but numerous interstate certification agreements exist to establish the process that a certified teacher must complete to become certified in a different state. These agreements exist mostly to accommodate teachers moving from one state to another and wishing to acquire a teacher certification in their new state of residence. If two states have an interstate certification arrangement, a certified teacher's educational training in one state will be recognized in the other member state. Even though an interstate certification agreement exists, however, it may not necessarily waive any additional tests or non-educational qualifications required by a particular state for a teacher's certification. The interstate certification agreements, therefore, establish the framework for recognition of teacher's educational preparation from state to state. A true reciprocal arrangement with respect to teacher certifications would require that a state accept a teacher's certification from another state without any additional qualifications.

Physicians Organizations. The National Committee for Quality Assurance (NCQA) is a private, not-for-profit organization that evaluates medical managed care plans on the basis of quality. Since 1991, NCQA has been accrediting managed care

³ Maureen A. Breitenberg, "The ABC's of Certification Activities in the United States," April 1997.

plans on the basis of their quality improvements, physicians' credentials, members' rights and responsibilities, preventive health services, utilization management, and medical reports. Although this accreditation is performed on a voluntary basis, half of HMOs have a relationship with NCQA, and more than 75 percent of Americans who belong to HMOs are in ones that have been assessed by NCQA. In addition, the Physician's Organization Certification Program was introduced in October 1997 with the goal of decreasing the number of audits of physician's groups by health plans for which they are under contract. Audit teams composed of physicians and managed care experts evaluate physician's organizations and provide their findings to an NCQA national oversight committee for the final decision on certification. The Physician's Organization Certification has replaced the multiple audits that managed care organizations were each required to perform on their contracting physician's organizations in order to assure appropriate oversight.

Women Business Owners. Businesses hoping to gain a competitive advantage in the acquisition process because they are owned or controlled by a woman have traditionally faced numerous and redundant certifications of their ownership status by corporations and government agencies as they compete for contracts. In January 1997, the Women Business Owners Corporation (WBOC) introduced its National Certification Program with the goal of creating one certification process to validate a business' woman owned status and thus increase the competitiveness of woman owned businesses. The WBOC Consortium members assess applicants and certify that a business is owned or controlled by a woman. In addition, the National Certification Program provides for reciprocity, in that the determination of a business' woman owned status by one WBOC Consortium member is to be accepted in its entirety by the other WBOC Consortium members.

To become certified, an applicant submits a certification application and additional third party analyses that document the business' legal status, financial background, and appraisals to the Consortium member in whose jurisdiction the applicant's headquarters is located. The Consortium member's Certificate Committee reviews the application and third party analyses and conducts an on-site audit, including interviews, scheduled and unscheduled visits, and the evaluation of other documentary material. The Certificate Committee then makes recommendations to the Consortium member's Board of Directors, which performs a final review of the businesses' application, third party analyses, and site visit reports and grants or denies certification

that a business is woman owned or controlled. Those businesses that receive certification are added to the WBOC International Women Business Owners Database, which government and industry may access when considering businesses for a contract.

D. INDUSTRY BEST PRACTICE FOR SUPPLIER CERTIFICATION

Recently, supplier certification or preferred supplier programs have become popular in industry. Juran defines *supplier certification* as "the process of evaluating the performance of a supplier, with respect to product quality, with the view of authorizing the supplier to self-certify shipments (if the evaluation concludes that the supplier's performance justifies such authorization)."⁴ Supplier certification programs are prevalent among prime contractors. In this section, we briefly describe specific prime contractor supplier certification programs to illustrate some of the benefits to both the customer and the supplier. Descriptions are summarized from source material listed in Appendix D.

In order to qualify for certification, suppliers of Raytheon Missile Systems must have a proven track record for product quality and on-time deliveries. Once certified, suppliers are able to ship their products to Raytheon facilities with minimal inspections. Some of the claimed benefits of this program are improved quality, increased productivity, elimination of material returns, and a reduction in on-site inspection.

Texas Instruments DS&EG has a formal supplier certification program in which the supplier is primarily responsible for incoming quality. TI conducts statistical process control (SPC) training at the supplier's facility and establishes the performance criteria necessary for certification. Once certified, suppliers receive preferential consideration from TI for new or follow-on work. The claimed benefits of this program include the reduction of redundant tests and inspection and improvements in measurement techniques.

Lockheed Martin has a program in which suppliers can achieve three different levels of certification—bronze, silver, and gold. Bronze certification requires a 100 percent quality part rating, a minimum of six lots delivered, and an approved quality system. The silver level requires an SPC program, a management letter of intent, and an on-site review. To receive the Gold level certification, the supplier must also have a continuous process improvement program. When certified, suppliers benefit from

⁴ J.M. Juran and Frank M. Gryna, *Juran's Quality Control Handbook*, Fourth Edition, McGraw-Hill, NY.

reduced surveillance and a preferred procurement status. Lockheed Martin GES claims many benefits from this program, including the following:

- A 2.1 percent improvement in purchased material inspection yield
- A 67 percent reduction in back lot backlog
- A 55 percent reduction in cycle time
- An 87 percent reduction in scrap.

AlliedSignal has two approaches to its objective of total product quality and a commitment to excellence. First, through its technology excellence endeavors, AlliedSignal has focused on management and processes in an effort to improve product quality. The company has introduced product scorecards as a means of tracking the present and goal sigmas for parts. In particular, variations are identified for deficient design margins, substandard incoming parts and material, and inadequate process capabilities. By introducing such methods, AlliedSignal is expected to increase quality, reduce cycle times, and better satisfy its customers. Second, and more directly related to the certification of suppliers, AlliedSignal has implemented an Integrated Product Development System (IPDS) that addresses such issues as lifecycle acquisition, collaboration across traditional functional areas, and the sharing of accountability. ISO 9001 is used by IPDS teams as a reference checklist to determine supplier compliance.

With the current industry focus on maximizing value and quality while also determining ways to eliminate the redundancy of basic systems audits, British Aerospace has introduced its Preferred Supplier Process (PSP). Through this process, a supplier is evaluated on the basis of three general categories: 1) a business assessment, 2) statistical process control, and 3) performance. Within these criteria, written information or metric data is collected on each supplier for items such as customer satisfaction, quality policies and methods, the prevention of problems, delivery, technology, support, statistical process control plans and audits, and responsiveness. Given the results of a supplier's evaluation based on these categories and measures, an award agreement, which emphasizes the continuous improvement of performance, is created between the supplier and British Aerospace. In the end, the supplier is assigned a gold, silver, or bronze supplier award status.

The Northrop Grumman Commercial Aircraft Division (NGCAD) has developed an Advanced Quality Practices (AQP) program as a means of preventing supplier defects and thus reducing the amount of variability witnessed in the products and services that it

receives from its suppliers. Suppliers use an AQP assessment survey to determine how their products and processes match up with the following criteria: 1) management commitment, 2) procedures and documentation, 3) training, 4) key characteristics, 5) improvement tools, 6) control charting, 7) key characteristic data analysis, 8) process improvement; and 9) AQP flowdown. NGCAD conducts on-site assessments to ensure that the necessary elements are in place to maintain key characteristics and continued improvement. Any identified deficiencies and their related corrective actions are also reviewed by NGCAD, and additional surveillance assessments of a supplier are conducted on an as needed basis.

In addition to these specific prime contractor supplier certification programs, one industry has proposed a new approach for companies to obtain quality management system (QMS) registration. In 1994, the electronics industry, led by Hewlett-Packard and Motorola, introduced an alternative method whereby a company could pursue and maintain its QMS registration. This effort was launched in response to the high cost of third party certification and the belief that certification requirements were becoming a new type of trade barrier (the electronics industry is highly dependent upon trade). Their philosophy is reflected in the following quote.

[A] company that has already achieved and demonstrated an effective, high-performing quality system should be allowed greater flexibility [and] less cost and bureaucracy to obtain or maintain accredited third-party certificates to management system standards.⁵

The Supplier Audit Confirmation (SAC) or System-Level Assessment's approach, therefore, provides companies with more autonomy in their QMS registration and replaces multiple audits with one that is performed by both internal and external auditors.

The SAC method envisions that a company would be able to prove and maintain its ISO 9000 registration through the documented results of both third party and internal audits. Third party audits would be performed only for three ISO 9000 criteria (management review system, internal audit process, and corrective action processes), while the company's internal audits would be accepted in determining compliance to the remaining 17 criteria.⁶ A company's internal auditors would have to meet specified qualifications relating to their knowledge of quality and auditing experience. The third

⁵ "Questions and Answers," System-Level Assessment (formerly called SAC) home page.

⁶ See Chapter II for a discussion of ISO 9000 and its criteria.

party would also retain the right to review and test a company's internal audit processes in order to verify the competence of the internal auditors.

Proponents of the SAC admit that this approach may be suitable only for those companies and/or industries that already possess advanced quality systems. Any company using this system, however, can reduce its costs, especially a company with multiple facility sites. Under the SAC system, a company's internal audits that encompass all facility sites can be considered in place of the individual third party auditing of each site.

E. OUTLINE OF THE REPORT

Chapters II and III describe and compare several quality system assessment programs and quality award programs. For purposes of this task, we consider the baseline for quality system audits to be registration of a contractor's quality management system to ISO 9000 or its U.S. equivalent, ANSI/ASQ Q9000. The baseline for quality awards is the Malcolm Baldrige National Quality Award. Because current government policy includes past performance as a source selection criterion, many government programs collecting information on contractor past performance offer some elements useful in the consideration of reciprocal agreements for quality system assessments. Past performance programs are described in Chapter IV. Reciprocal agreement organizations and policy are discussed in Chapter V. Chapter VI concludes the report with summary recommendations.

II. QUALITY SYSTEM ASSESSMENT PROGRAMS

This chapter summarizes and compares the current quality system assessment programs in industry and the government, using ISO 9000 (or its U.S. equivalent, ANSI/ASQ Q9000) as a baseline for comparison. Most of the programs in this chapter are based on ISO 9000 and in fact expand on its qualifications. The program descriptions are summarized from the specific references listed in Appendix D. A comparison of the specific criteria of the different programs is included at the end of the chapter, and the specific criteria are listed in Appendix A.

A. BASELINE—ISO 9000

With the increasing flow of goods and services from one country to another in the global marketplace, a need developed for a system of guidelines to standardize varying national approaches to quality. Recognizing that need, the International Organization for Standardization (ISO) established ISO 9000¹ as a system of procedural guidelines to be implemented and monitored by companies to ensure the consistency of their products and services. The purpose of ISO 9000 is twofold: 1) to explain the similarities and dissimilarities of different quality concepts; and 2) to provide advice on how to choose and implement these established international standards as a means of achieving internal quality management.

ISO 9000, in actuality, represents a series of standards that includes ISO9000-1, ISO9001, ISO9002, ISO 9003, and ISO9004-1. Each of the ISO 9000 standards provides a quality assurance model to be used by companies, but each deals with a separate functional area. The functional focus areas are broken down as follows: design, development, production, installation and servicing (ISO9001); production and installation and servicing (ISO9002); final inspection and test (ISO9003); and quality management and quality systems elements (ISO9004-1). All of the standards represented by the ISO 9000 series illustrate the types of elements that should exist in a company's quality system but do not prescribe how to implement them. Individual companies have their own

¹ The U.S. equivalent standard is the American Society for Quality (ASQ) Q9000 series of standards.

specific products, objectives, and requirements and therefore must design and implement processes that satisfy the general guidelines as well as their own unique needs.

ISO standards are expected to go through a process of revision every 5 years. Such an endeavor is currently being conducted by the ISO technical committee (TC) 176, which is the body responsible for ISO standards. This revision is tentatively due in draft form in mid 1999. The focus of TC 176 has been to listen to the input of ISO 9000 customers and seek the convergence of quality standards, both within and outside the ISO 9000 family of standards. As a start, TC 176 is expected to discontinue the present ISO9002 and ISO9003 as independent entities and integrate them into ISO9001. In addition, in reference to standards outside the ISO 9000 family, the TC 176 is looking at ways to address specific industry issues within the revisions. In fact, it has considered making the enhanced basic portion of QS-9000² a part of the ISO9001 revision.

From this point forward in this report, however, the term ISO 9000 will be considered to refer specifically to ISO9001, which focuses on the processes of design, development, production, installation and servicing. ISO 9000 most often is associated with ISO9001 since, of the four quality assurance models in the ISO 9000 standard series, ISO9001 is the most comprehensive in scope.

Companies seeking ISO 9000 registration are evaluated on the basis of 20 criteria: 1) management responsibility; 2) quality system; 3) contract review; 4) design control; 5) document and data control; 6) purchasing; 7) control of customer-supplied product; 8) product identification and traceability; 9) process control; 10) inspection and testing; 11) control of inspection, measuring and test equipment; 12) inspection and test status; 13) control of nonconforming product; 14) corrective and preventive action; 15) handling, storage, packaging, preservation, and delivery; 16) control of quality records; 17) internal quality audits; 18) training; 19) servicing; and 20) statistical techniques. Through the ISO 9000 registration process, a third party provides assurance that a company or organization has fulfilled quality management system requirements of the standard.

The time to attain ISO 9000 registration will vary, ranging from 6 to 18 months depending upon the size of the company seeking registration and the initial maturity of its quality system. During the preassessment phase, the company may perform a self-assessment or contract with a third party registration agency to assess the existing quality

² See Section B.3 of this chapter for QS-9000.

management system. If the existing system does not meet the requirements, a quality system that addresses ISO 9000 standards and criteria is then implemented. In the formal assessment phase, the third party registration agency (registrar) conducts an audit of the quality management system to determine its compliance with the requirements of the ISO 9000 standard. Once the registrar determines that the company or organization is in compliance with ISO 9000 requirements, the registrar issues a certificate of compliance. The integrity of the registration is upheld through the use of surveillance audits, which can be undertaken at varying intervals depending on the registrar. The registration usually expires at the end of 3 years.

B. INDUSTRY PROGRAMS

1. Boeing D1-9000

In the aerospace industry, studies have shown that production costs are adversely affected by the cost associated with correcting the quality problems of parts produced with production methodologies based on cost rather than quality. Boeing established and implemented the quality approval system D1-9000 to factor in the cost and savings associated with ensuring that the company, its suppliers, and subcontractors conform to certain quality standards. The overriding objective of D1-9000, therefore, is to provide a supplier with the tools and methods necessary to commit to ongoing improvements in the quality of products and processes that will yield fewer quality defects, reduced waste, satisfied customers, and continuing profits.

D1-9000 encompasses two types or phases of approval: 1) Basic Quality System (BQS) and 2) Advanced Quality System (AQS). The D1-9000 BQS has been structured using the quality standard criteria from ISO9002. Although these ISO9002 criteria are considered the minimum requirements to receive D1-9000 BQS approval, a supplier's third party ISO registration does not automatically translate into Boeing approval of that supplier. The AQS approval represents a process whereby a supplier meets the criteria for the BQS and can prove its ability to maintain and/or reduce the variations in key characteristics (which are the vital hardware or process factors that have a disproportionately high effect on the performance of the end product) in order to improve quality. For both types of approval, D1-9000's approach toward the 20 criteria and key characteristics focuses on those products and services directly related to a supplier's relationship with Boeing.

Boeing suppliers must achieve D1-9000 BQS or AQS approval and are encouraged by Boeing's procurement quality assurance representatives to adopt the D1-9000 quality approach. During the formal assessment phase, a supplier's quality and production processes are studied. Suppliers then respond to any nonconformities with D1-9000 criteria that were unveiled during the initial audit, and additional audits are conducted to ensure that appropriate corrective actions have eliminated the previously noted deficiencies. Once the supplier satisfactorily implements all corrective actions, it receives D1-9000 approval. During the postassessment phase, a supplier maintains its Boeing D1-9000 approval status by submitting further maintenance audits, while Boeing monitors the report of any quality violations or concerns raised by the supplier's customers. Furthermore, a Boeing D1-9000 supplier is expected to flowdown these quality approaches to its subcontractors, thereby improving quality throughout all processes contributing to the production of products or services.

2. Aerospace Industry AS9000

The Aerospace Basic Quality System Standard (AS9000) was created by a group of prime contractors from the aerospace industry acting as a subcommittee under the auspices of the Aerospace and Defense Division of the ASQ. AS9000 was developed in an effort to eliminate redundant and overlapping quality requirements in the aerospace industry, without jeopardizing the continuing production of quality products and services.

The overriding objective of AS9000 is to focus on processes in order to provide for an ongoing reduction in defects. Indeed, the AS9000 philosophy is not only to identify defects, but to seek out and implement the necessary means for preventing defects.

AS9000 was developed as an aerospace industry quality standard because ISO 9000 was regarded as inadequate to ensure quality within that industry. The subcommittee that drafted AS9000 did take ISO 9000 into consideration, however, along with Boeing's D1-9000 and other existing quality standards. AS9000 draws its basic structure from the 20 criteria spelled out in ISO 9000, but it enhances the 20 criteria with aerospace industry-specific requirements and a series of notes that address key characteristics, the flowdown of quality, and other specific industry needs.

A supplier that is seeking AS9000 validation presently has several options. The American Aerospace Quality Group (AAQG), which is responsible for AS9000, lists several means for obtaining validation to AS9000: first party self-assessment, second party audits, or audits by a third party Performance Review Institute (PRI) registrar. The

AS9000 process criteria should be considered as compatible with those implemented for ISO 9000 registration. Indeed, the AS9000 compliance process may be conducted in tandem with a supplier's ISO 9000 registration. In addition, under the auspices of the National Aerospace and Defense Contractors Accreditation Program (NADCAP), a supplier can supplement its reaccreditations and ISO surveillance audits with AS9000 compliance.³

3. Automakers QS-9000

In 1992, the three major automakers (Ford, Chrysler, and General Motors) undertook the challenge to create a single automotive industry quality standard to replace their individual quality requirements. QS-9000 was the resulting automotive industry quality standard born of this process to simplify the quality standards environment in which suppliers to the Big 3 were operating. The purpose of QS-9000 is threefold: 1) to decrease the number of audits and their redundancies as experienced by suppliers; 2) to provide the documentation and control necessary to continuously improve quality; and 3) to improve suppliers' dialogue with their customers.

QS-9000 is an automotive industry-specific quality system based on the framework of ISO9001. The 20 basic criteria detailed in ISO9001 are considered a prerequisite for QS-9000 registration; however, ISO9001 conformance alone may be insufficient because it does not include the additional automotive industry and customer requirements of the QS-9000 criteria. In addition, although QS-9000 owes its basic structure to ISO 9000, the two standards have a fundamental difference in their approaches to quality. Whereas ISO 9000 is a descriptive document for a quality system, QS-9000 adopts a much more prescriptive approach, detailing not only what a quality system should contain, but also how it may be achieved. Furthermore, QS-9000 approval involves satisfying sector-specific requirements (production part approval process, continuous improvement, and manufacturing capabilities) and those requirements specified individually by Chrysler, Ford, and General Motors.

Internal and external suppliers of the Big 3 have been given a timetable for attaining QS-9000 registration. The QS-9000 registration process very closely mirrors that of ISO 9000. The supplier begins the process by receiving information on the QS-9000 quality system. During the presassessment phase, the supplier formally applies for QS-9000

³ See further reference to PRI and NADCAP in Section V.B.2.

registration and provides the necessary preliminary documentation. A third party auditor conducts a registration audit and a series of follow-up audits to ensure that identified nonconformities have been adequately addressed. Once a supplier's nonconformities have been eliminated, QS-9000 compliance registration is conferred on the supplier. The validity of this registration is maintained by surveillance audits conducted every 6 months.

C. GOVERNMENT PROGRAMS

1. Army—Contractor Performance Certification Program

The Contractor Performance Certification Program (CP)2 represents the Army's response to trends within the Department of Defense to cut government and contractor administrative costs while increasing levels of contractor quality and performance. (CP)2 is a voluntary supplier recognition program in which the Army utilizes an established methodology and set of measures to appraise contractors' development, production, and maintenance facilities in order to identify those contractors with a commitment to quality, customer satisfaction, and improved products and processes. The relationship that the Army builds with (CP)2 contractors yields the following benefits for the Army and the government: 1) the means to ensure that acquisition activities involve quality products that meet the needs of the customer; 2) greater efficiency and decreasing product costs achieved through continual improvements in product and process quality; and 3) a reduction in the need for government oversight and, therefore, declining administrative costs.

The (CP)2 is a voluntary program open to any contractor that has pursued or made plans to pursue contracts with the Army Materiel Command's (AMC) Major Subordinate Commands (MSCs). The contractor commits to a multiphase assessment process that may take more than 2 years to reach a conclusion and actually bestow (CP)2 status upon the contractor. The preliminary phase provides the contractor with information on (CP)2 and signals the contractor's formal intent to enter the program. During the preassessment phase, the contractor submits information on its facilities, organizational structure, and past performance, and the contractor and MSCs determine which of the three (CP)2 "certification" types is being sought: 1) production certification; 2) design and development certification; and 3) production, design, and development certification. The assessment phase consists of a baseline and final assessment by an assessment team (composed of individuals belonging to the MSCs and contractor) using 28 specifically

defined criteria and a series of additional assessment audits requested by the contractor to verify that suggested corrective actions have been implemented. Recognition happens only after all of the MSCs' concerns have been adequately addressed and a memorandum of agreement is issued detailing the scope and responsibilities of the contractor's (CP)2 status.

Once the contractor has received (CP)2 status, a postassessment phase commences during which the contractor provides periodic reports on its management and program, while the government reserves the right to request additional complete or partial assessments as a condition for extending a contractor's certification. Despite the extensive, time-consuming (CP)2 assessment process, contractors seek this (CP)2 status because they benefit from the resultant reduced scrap and rework, decreased customer complaints, better yield rates, improved reputations for facilities, increased competitiveness, and reduced contract administrative costs.

(CP)2 borrows its basic framework from that established by ISO 9000. In fact, (CP)2 uses the 20 assessment criteria of ISO 9000 as part of its own assessment criteria and, further, considers them a minimum level that must be achieved with respect to (CP)2's first 20 criteria. In implementing the 20 criteria adopted from ISO 9000, (CP)2 places additional emphasis on enhancements to practices and principles. Essentially, (CP)2 differs from ISO 9000 in two ways: it encourages the use of process metrics and places greater emphasis on collecting and documenting physical data. In addition to the 20 criteria adopted from ISO 9000, (CP)2 uses 8 additional criteria to assess contractors: customer satisfaction; quality costs; warranty performance; ethics; business planning; safety; environmental; and continuous improvement process.

2. FAA—Aircraft Certification Systems Evaluation Program

The Aircraft Certification Systems Evaluation Program (ACSEP) is a program for the comprehensive evaluation of aviation quality. It centers on auditing aircraft and aviation industry suppliers based on Federal Aviation Regulations requirements. The Federal Aviation Administration (FAA) designed the ACSEP both to ensure that its own needs and the needs of the aircraft industry were being met, and to adopt a system of standard methods compatible with the aircraft manufacturing and internationally recognized standards. By implementing the ACSEP, the FAA has established a set of

standards for evaluating quality performance and a means of collecting information on standards applied throughout the industry over and above those presently required by the FAA.

Aircraft industry contractors seeking ACSEP certification are assessed by a team of evaluators who have completed specialized training and participated in a number of evaluations as trainees. The evaluations consist of an extensive series of questions that center on the ACSEP's six major systems: 1) quality; 2) engineering; 3) communications with the FAA; 4) manufacturing; 5) service and product; and 6) management. Contractors are further assessed on the basis of 17 subsystems: organization and responsibility; design data control; software quality assurance; manufacturing processes; special manufacturing processes; statistical quality control; nonconforming material; material handling and storage; nondestructive inspection; tool and gauge; testing; internal audit; global production; supplier control; airworthiness determination; Federal Aviation Regulations reporting requirements; and manufacturing facility.

After assessing a supplier in terms of the ACSEP major systems and subsystems, the evaluation team holds a postevaluation conference with the supplier's management to review the findings. If a nonconformance is identified under ACSEP's major systems or subsystems, it is presented to the audited supplier and the principal inspector assumes responsibility for monitoring the supplier to ensure that formal corrective actions have been implemented. The audit evaluation data is then entered into an ACSEP data base.

3. Defense Logistics Agency (DLA)—DSCC and DISC

a. Defense Supply Center Columbus—Qualified Manufacturer's List

The Qualified Manufacturer's List (QML) and related Qualified Products List (QPL) were established to help the government identify contractors with a history of demonstrated quality. But unlike the other quality assessment programs described so far in this paper, the QML qualifies contractor processes and materials—not the contractors themselves. It is described here for completeness.

A QML is established and compiled in relation to the announcement of a new specification and its qualification requirements. A specification has qualification requirements when a contractor's products and processes must meet certain standards before a contract is awarded. When qualification requirements are attached to a specification, it is the government agency's responsibility to encourage manufacturers to

specification and its qualification requirements are announced, it is the manufacturer's responsibility to request a qualification.

Manufacturers undergo the QML process to test their processes and materials against a specification's requirements because future acquisition awards will be granted only to those contractors with processes and materials that have been tested by and included in the QML. The formal assessment phase of the QML qualification process involves an audit of the manufacturer's facilities and a series of tests as presented in the specification's qualification requirements. The manufacturer is notified of the testing results and, if it has failed, provided with an explanation as to why the testing and test results were not approved. A manufacturer whose processes and materials have been determined to fulfill the specification's qualification requirements is notified in writing that the particular process or material that was tested will appear on the QML for the specification.

QMLs are monitored by the DLA's Defense Supply Center Columbus, Sourcing and Qualifications Unit (DSCC-VQ). Every 2 years, the DSCC-VQ reviews the specification and its qualification requirements to determine whether they should be continued and maintained. Once this review is complete and a specification and its qualification requirements have been retained, the manufacturer whose process or material appears on the QML must affirm or reaffirm its status. Depending upon the specifics laid down by the qualification requirements of a specification, a manufacturer will have to do one of three things: 1) certify its qualification status; 2) submit to periodic retesting; or 3) undertake a complete series of tests to requalify.

b. Defense Industrial Supply Center—Qualified Suppliers List for Distributors/Qualified Suppliers List for Manufacturers

Distributors and manufacturers can pre-qualify themselves for consideration in future acquisition competitions through the Qualified Suppliers List (QSL) program managed by the Defense Industrial Supply Center (DISC). This program evaluates distributors and manufacturers for specific commodity groups and produces two types of lists: the Qualified Suppliers List for Distributors (QSLD) and the Qualified Suppliers List for Manufacturers (QSLM). These lists represent distributors and manufacturers that have been determined to possess the necessary quality and control practices to allow source inspections of individual contracts and pre-award surveillance to be replaced by acceptance of these distributors' and manufacturers' commercial business practices. This

acceptance of these distributors' and manufacturers' commercial business practices. This is a similar practice to industry's preferred supplier practices or supplier certification programs described in Section I.D.

The resulting benefits of the QSLD and QSLM are improved quality and decreased lead times for product delivery. Furthermore, the QSLD and QSLM are expected to result in declining life cycle costs and increased customer satisfaction. At present, however, there are only three commodity group areas for which QSLDs and QSLMs exist. These commodity areas are as follows:

- Bulk Metals QSLD
- Class 3 Threaded Fastener National Stock Number (NSN) QSLD and QSLM
- Blind Aerospace Rivets (Federal Supply Certification [FSC] 5320) QSLD and QSLM

A QSLD and QSLM are expected in the near future for the Fiber Rope, Twine, and Tape (FSC 4020) commodity group. Furthermore, consideration is being given to the applicability of the QSLD or QSLM programs to the O-Rings (FSC 5330) and Builders Hardware (Part of FSC 5340) commodity groups.

To be considered for inclusion on a QSLD or QSLM, a distributor or manufacturer must:

- Possess and use a documented quality program that meets DISC criteria
- Maintain a single quality control program
- Have a Commercial and Government Entity code (CAGE)
- Submit a re-qualification application within 120 days of qualification expiration

DISC assesses distributors and manufacturers on the basis of criteria specifically established for a commodity group in order to determine the existence of process controls. If such controls exist and are used on a daily basis, and if the distributor and manufacturer meet all of the DISC criteria, there is a level of assurance that the products procured will meet specification requirements. With the criteria having been met, the distributor or manufacturer is placed on the QSLD or QSLM for that specific commodity group and, therefore, may compete with other QSLD or QSLM members for future DISC procurement contracts under this program's solicitations.

D. QUALITY SYSTEM ASSESSMENT PROGRAM COMPARISONS

Appendix A contains lists of the process, auditor, and results criteria for the programs described in this chapter. The tables in this section compare those criteria.

1. Process Criteria

Table II-1 compares the process criteria of the eight programs described in this chapter. Process criteria are the attributes of the assessment process itself. ISO 9000 process criteria are used as the baseline.

2. Auditor Criteria

We discovered little information on the scope and breadth of auditor criteria during our evaluation of quality system assessment programs. Most of the programs do, however, call for registration to be conferred by a third party. When a quality system assessment program allows or calls for a third party registrar, an individual auditor— independent of a contracting activity's customer or supplier—confirms that the supplier has met or exceeded the established requirements for a quality system. To ensure that the third party auditor is capable of performing quality system audits, a supplier generally will seek an auditor whose quality system auditing abilities have been approved to be of the highest level. Auditors are approved in two ways—certification and accreditation—by two different organizations—The American Society for Quality (ASQ) and the Registrar Accreditation Board (RAB).

The ASQ established its auditor certification program in 1966 and currently runs several programs that certify auditors under the following categories: quality engineer, quality auditor, reliability engineer, quality technician, mechanical inspector, quality manager, and software quality engineer. Auditor certification indicates that an auditor has quality assurance experience and has been tested and proven to possess a core of knowledge in the quality system auditing concepts and a specific standard, such as ISO 9000.

Table II-1. A Comparison of Quality System Assessment Program Criteria: Process Criteria (page 1 of 2)

<i>Program</i>	<i>Preassessment of Existing Quality System</i>	<i>Design and Implement Quality System Compliant with Program Criteria</i>	<i>Registration Audit</i>	<i>Issues of Noncompliance Noted</i>
ISO 9000	Contractor self-assessment or assessment by third party	Applicability of this criterion dependent upon the maturity of the existing quality system	Registration audit conducted by a third party registration agency	Done by the third party registration board
Industry Programs				
D1-9000	Not addressed	Not addressed	Initial qualification audit conducted by Boeing procurement quality assurance representative	Includes conformity to Boeing specific requirements
QS-9000	Not addressed	Not addressed		
AS9000	Not addressed	Not addressed	Can be 1st, 2nd, or 3rd party registrar for validation	
Government Programs				
Army—(CP)2	Contractor performs self-assessment	Not addressed	Baseline assessment conducted by MSC assessment team, including contractor and government personnel	Corrective actions noted
FAA—ACSEP	Not addressed	Not addressed	Conducted by FAA-trained auditor	Detailed during the post-evaluation conference
DSCC—Qualified Manufacturer's List	Not addressed	Not addressed	Applicability of an audit of manufacturing facilities depends on requirements of the specification	After the testing phase, the manufacturer is notified of the results and given an explanation if testing was not approved
DISC—QSLD/QSLM	Not addressed	In addition, supplier must maintain a single quality control program and possess a CAGE code	DISC agent conducts site survey when deemed necessary (but, other industry audits/surveys may be considered by DISC for review and used in place of an additional QSL site survey)	

LEGEND: Shaded boxes represent similarity to ISO 9000 definition at top of table.
Text explains deviations from the ISO 9000 definition.

Table II-1. A Comparison of Quality System Assessment Program Criteria: Process Criteria (page 2 of 2)

<i>Program</i>	<i>Series of Audits to Determine that Noncompliance has been Addressed</i>	<i>Certificate of Conformance</i> Issued by the third party registration agency	<i>Surveillance Audits</i> Varying time intervals	<i>Certification Expiration</i> Usually after 3 years
Industry Programs				
D1-9000	Audits conducted by Boeing procurement quality assurance representative	D1-9000 BQS or AQS approval	Maintenance audits at unspecified intervals	Not addressed
QS-9000			Every 6 months	Quality system must be reviewed in its entirety at least every 3 years
AS9000		Statement of AS-9000 compliance issued	Every 6 months	Not addressed
Government Programs				
Army—(CP)2	Additional and final assessment conducted by the MSC assessment team	Memorandum agreement issued between government and contractor	Contractor submits continuous improvement program data semiannually and the lead MSC performs an annual management/program review	After 3 years, a determination is made on whether a full or partial assessment is needed to extend certification
FAA—ACSEP	Correction of noncompliance issues tracked by the principal investigator		Not addressed	Evaluations take place every 24 or 48 months, depending on the type of facility being evaluated
DSCC—Qualified Manufacturer's List	Not addressed	Letter of notification denotes that a product or process has qualified and will appear on the appropriate specification's QML	Not addressed	At the time of the 2-year review, a manufacturer must formally apply for certification of qualification status to remain on the QML
DISC—QSLD/QSLM	Noncompliance noted and corrective actions provided in a Letter-Notice of Denial of Qualification from DISC, which must be addressed in set time frame	Letter-Notice of Qualification issued by DISC	Random announced and unannounced post-award audits, including the independent lab testing of random samples, by DISC	Qualification lapses in 3 years and a request for requalification must be entered 120 days prior to this expiration

LEGEND: Shaded boxes represent similarity to ISO 9000 definition at top of table.
Text explains deviations from the ISO 9000 definition.

The Registrar Accreditation Board (RAB), established by the ASQ in 1989 as an independent auditor accreditation body, conducts U.S. third party auditor accreditation and certification. Under the RAB program, *auditor accreditation* refers to approval of the written policies and procedures that an auditor follows to perform quality audits.⁴

The criteria followed by RAB for accrediting auditors incorporates criteria requirements used by the European Union, European Free Trade Association, and other world accreditation bodies.⁵ Auditors seeking accreditation complete a RAB application and submit to an initial review to determine if they meet the basic criteria. A RAB auditing team investigates the auditor's office and evaluates the auditor's performance of a supplier audit. The team evaluates any resulting corrective actions and produces a report that recommends whether to grant or withhold the auditor's accreditation. The RAB Accreditation Council reviews the auditor's report and has the final authority over the auditor's accreditation status. If determined to have successfully fulfilled the relevant criteria for auditor accreditation, the auditor is issued a certificate. Auditors are required to maintain accreditation by continuing to participate in quality audits and reapplying for their auditor accreditation status on an annual basis.

The RAB's program to certify auditors to perform quality audits is based on standards' criteria, such as those in the ISO 9000 family. Auditors must fulfill basic requirements in the categories of education, training, and experience in the field to be audited and quality system auditing. An auditor's qualification level determines the level to which the auditor may be certified. RAB certifies auditors at three levels: 1) Quality Systems Provisional Auditor; 2) Quality Systems Auditor; or 3) Quality Systems Lead Auditor. This three-level system allows an auditor to advance as quality audit knowledge and experience is gained; however, an auditor is allowed to apply for certification at whichever level best meets his or her present qualifications.

The Quality Systems Provisional Auditor category is intended for those individuals with little or no experience participating in the quality audit process. The individuals

⁴ RAB has also worked to enhance the U.S. registrar accreditation system. In 1991, it worked with the American National Standards Institute (ANSI) to establish the American National Accreditation Program for Registrars of Quality Systems. RAB maintains an active role in administering this program.

⁵ Specifically, RAB incorporates accreditation criteria from the following: 1) ISO/IEC Guide 48, Guidelines for Third-Party Assessment and Registration of a Supplier's Quality System; 2) EN 45012, General Criteria for Certification Bodies Operating Quality Systems Certification; and 3) ISO 10011, Guidelines for Auditing Quality Systems.

must, however, have completed training and an examination on the fundamentals of auditing and ISO 9000 or other quality system standard, and they must have a bachelor's degree or lesser degree supplemented by relevant work experience. Two sponsors are also needed to attest to the individual's personal attributes. An individual may remain a Provisional Auditor for 3 years, at the end of which the requirements to become a Quality Systems Auditor must have been satisfied; otherwise the certification status will be terminated.

Aside from advancing from Provisional Auditor status, an individual may apply directly to that of a Quality Systems Auditor level. The Quality Systems Auditor is intended for those individuals who have already amassed some years of auditing experience. An individual applying for this auditor level will have proven his or her competence in the fundamentals of auditing and ISO 9000 or other quality system standard. In addition, depending upon the formal education level, the applicant must have already observed and participated in a prescribed number of quality audits. These audits may or may not have been witnessed by an existing Lead Auditor, but if one wishes to eventually advance to the Lead Auditor level, it is advisable that the audits be observed.

Finally, to become a Quality System Lead Auditor, an individual must have demonstrated an ability to both participate in and lead quality audits. The auditor applicant must have completed a total of five quality audits as the lead auditor on a team of at least two other auditors. Lead auditor status is conferred upon those individuals who have shown their proficiency with such quality system issues as documentation review, on-site auditing activities, and producing auditing reports.

3. Results Criteria

Table II-2 compares the results criteria of the programs with the 20 elements of ISO 9000. Results criteria are those characteristics against which the quality system is judged. The FAA ACSEP, DSCC QML/QPL, and DISC QSLM/QSLD programs are not included in the table because their results criteria are too different from the other programs for their inclusion in a comparison table to be meaningful. Details about the last column of the table, *Additional Criteria Beyond ISO 20 Elements*, can be found in Appendix A.

Table II-2. A Comparison of Quality System Assessment Program Criteria: Results Criteria (page 1 of 7)

<i>Program</i>	<i>1. Management Responsibility</i>	<i>2. Quality System</i>	<i>3. Contract Review</i>
ISO 9000	Supplier management creates/ documents policy/ approach toward quality; need to define authority and interaction of employees and a verification system of resources and personnel dealing with quality; and quality system to be reviewed at set intervals	Supplier creates and manages a quality system to verify that products meet established requirements	Supplier creates and organizes procedure for the reviewing and coordinating of contracts
Industry Programs			
D1-9000		Boeing to be informed in writing of any change in the quality control system	
QS-9000	Includes a formal business plan, documentation of trends and benchmarks in quality, and methods for determining customer satisfaction	Suppliers are to identify special characteristics and use cross-functional teams and the advanced product quality control plan to prepare quality plans	
AS9000		Maintain control plans for measuring key characteristics and identifying flowdown requirements to subcontractors	
Government Programs			
Army—(CP)2			

LEGEND: Shaded boxes represent similarity to ISO 9000 definition at top of table.
Text explains deviations from the ISO 9000 definition.

Table II-2. A Comparison of Quality System Assessment Program Criteria: Results Criteria (page 2 of 7)

<i>Program</i>	<i>4. Design Control</i>	<i>5. Document and Data Control</i>	<i>6. Purchasing</i>
ISO 9000	Supplier creates and manages procedures to verify that product design meets requirements; design plan identifies responsibility for each design step; design input and output requirements documented; establish measures for design verification and procedure for modifications	Procedures set for the control of information and data related to ISO standards; procedure for the modification of these documents and procedures	Supplier proves that product meets established requirements; keeps records on the acceptability of subcontractors; maintains detailed data on products ordered; purchaser verifies that product meets established requirements
Industry Programs			
D1-9000			Concept of a quality flowdown system to subcontractors
QS-9000	Details specific skills in which a supplier's design activity is to be qualified	Suppliers must mark special characteristics and create a procedure for reviewing and using engineering specifications	Suppliers are expected to encourage subcontractors to develop similar quality systems
AS9000	Applies only to supplier with responsibility for the design of a particular product and the method of eliciting customer approval, if required	Supplier to maintain records on the effectiveness of modifications	Supplier subcontracts always to include a right of entry clause and establish the flowdown of quality requirements
Government Programs			
Army—(CP)2			

LEGEND: Shaded boxes represent similarity to ISO 9000 definition at top of table.
Text explains deviations from the ISO 9000 definition.

Table II-2. A Comparison of Quality System Assessment Program Criteria: Results Criteria (page 3 of 7)

<i>Program</i>	<i>7. Control of Customer-Supplied Product</i>	<i>8. Product Identification and Traceability</i>	<i>9. Process Control</i>
ISO 9000	Supplier creates procedure for verifying, documenting, and storing production components/products supplied by the customer	Supplier creates procedure for identifying product (drawings or specifications) throughout the stages of development or production	Supplier plans production and installation processes that affect quality (applies to controlled conditions and those processes that cannot be fully tested until product is in use)
Industry Programs			
D1-9000	Permission is needed from Boeing, its customers, or the government prior to the disposal of any property they provided to the supplier		If process specification requirements exist, the supplier must monitor/verify them on a regular basis. Suppliers must adhere to Boeing's documents with respect to production, verification, and modification of tools
QS-9000			Provide explicit instructions on the operation of processes to all relevant employees
AS9000			Contract language can specify the monitoring and control of key characteristics
Government Programs			
Army—(CP)2			

LEGEND: Shaded boxes represent similarity to ISO 9000 definition at top of table.
Text explains deviations from the ISO 9000 definition.

Table II-2. A Comparison of Quality System Assessment Program Criteria: Results Criteria (page 4 of 7)

<i>Program</i>	<i>10. Inspection and Testing</i>	<i>11. Control of Inspection, Measuring and Test Equipment</i>	<i>12. Inspection and Test Status</i>
ISO 9000	Supplier not to use incoming product before verifying it against requirements using the established quality procedures; Document that requirements have been met; Keep records of products having passed verification process	Supplier responsibility for the control and maintenance of testing and measuring equipment	Marking system for products of conformance and nonconformance with regard to specific tests
Industry Programs			
D1-9000	A qualified outside source may be used for inspection and testing services, as long as authority has been properly delegated. In addition, must collect and maintain first article of test data	Must have established system for the recall of measuring devices and products	Requires a system of inspection stamps to identify product status
QS-9000	Zero defects required for the acceptance of attribute data sampling	Analysis of and specific records to be kept for all testing equipment	
AS9000	Inspection function may be subcontracted; Supplier will have in place a first article inspection and verification procedure		
Government Programs			
Army—(CP)2			

LEGEND: Shaded boxes represent similarity to ISO 9000 definition at top of table.
Text explains deviations from the ISO 9000 definition.

Table II-2. A Comparison of Quality System Assessment Program Criteria: Results Criteria (page 5 of 7)

<i>Program</i>	<i>13. Control of Nonconforming Product</i>	<i>14. Corrective and Preventive Action</i>	<i>15. Handling, Storage, Packaging, Preservation, and Delivery</i>
ISO 9000	Set procedure so that nonconformance products are not used or installed	Supplier must create a procedure for evaluating products and processes related to nonconforming products, take preventative measures, verify that corrections have been made, and document any procedural changes	Supplier to establish procedure for the handling, storage, packaging and delivery of products so as to avoid damage and deterioration
Industry Programs			
D1-9000	Supplier not to mark product as "use-as-is" or "repair" unless agreed by customer; scrap and regrade material marked to avoid use for original purpose; system for reporting deficiencies found with respect to already delivered products	Supplier to document any corrective action using a specified Boeing response format	Supplier must ensure that Boeing products greater than contract quantity are secure and not sold to third party
QS-9000			System to be implemented to control inventory and monitor delivery performance
AS9000		Special effort to identify any foreign bodies while handling the product	
Government Programs			
Army—(CP)2			

LEGEND: Shaded boxes represent similarity to ISO 9000 definition at top of table.
Text explains deviations from the ISO 9000 definition.

Table II-2. A Comparison of Quality System Assessment Program Criteria: Results Criteria (page 6 of 7)

<i>Program</i>	<i>16. Control of Quality Records</i>	<i>17. Internal Quality Audits</i>	<i>18. Training</i>
ISO 9000	Establish procedure for the recording and organization of quality records	System of internal quality audits to verify that activities meet established requirements and that the quality system is effective	Establish procedure to identify the need and provide training for employees dealing with quality
Industry Programs			
D1-9000	Quality records to be maintained for 7 years and made available to Boeing	Supplier to conduct annually an internal audit to ensure D1-9000 conformance	Need a method for evaluating the proficiency of personnel in tasks related to quality
QS-9000			
AS9000	Quality records to be open for review by customers and regulating bodies		
Government Programs			
Army—(CP)2			

LEGEND: Shaded boxes represent similarity to ISO 9000 definition at top of table.
Text explains deviations from the ISO 9000 definition.

Table II-2. A Comparison of Quality System Assessment Program Criteria: Results Criteria (page 7 of 7)

<i>Program</i>	<i>19. Servicing</i>	<i>20. Statistical Techniques</i>	<i>Additional Criteria Beyond ISO 20 Elements</i>
ISO 9000	Establish procedure to determine that servicing meets specific requirements	Establish procedures to identify statistical techniques to assist in determining the acceptability of process capabilities and product characteristics	None
Industry Programs			
D1-9000		Statistical techniques to include sampling plan approved by Boeing	Advanced Quality System approval requires the satisfaction of 4 additional criteria concerned with defining key characteristics, identifying and controlling variations, and orienting processes for input and output control
QS-9000			Approval also includes 3 sector-specific criteria on continuous improvement, manufacturing capabilities, and the process for production part approval. In addition, each of the Big Three automakers has its own specific supplier requirements.
AS9000		The method of sampling for the purpose of inspection must meet customer approval	None
Government Programs			
Army—(CP)2			Certification to (CP)2 involves 8 additional criteria: Customer satisfaction; quality costs; warranty performance; ethics; business planning; safety; environmental; and continuous improvement.

LEGEND: Shaded boxes represent similarity to ISO 9000 definition at top of table.
Text explains deviations from the ISO 9000 definition.

III. QUALITY AWARD PROGRAMS

Quality awards differ from the programs described in Chapter II because they are not specific to the contractor's quality system—they consider the quality of the whole organization. For these awards, we use the 1997 Malcolm Baldrige National Quality Award as the baseline. The program descriptions include the three criteria areas—process, auditor, and results—as in the last chapter. A comparative section is included at the end. All summary descriptions are taken from complete texts found in the references listed in Appendix D.

A. MALCOLM BALDRIGE NATIONAL QUALITY AWARD

The Malcolm Baldrige National Quality Award (Baldrige Award) was established in 1987 to be presented annually to U.S. companies that have demonstrated a commitment to quality and competitiveness. Its defining objective includes fostering a commitment to quality, awareness of its importance to a company's health or our nation's economy, and open dialogue among companies based upon their knowledge and experience with various quality strategies. The award is based on a set of 10 core values: 1) customer-driven quality; 2) leadership; 3) continuous improvement and learning; 4) employee participation and development; 5) fast response; 6) quality and prevention in design; 7) long-range view of the future; 8) management by fact; 9) company responsibility and citizenship; and 10) results focus.

The Baldrige Award represents a public-private partnership whereby private sector businesses with success in quality management are evaluated and enlightened by this federally funded program managed by the National Institute of Standards and Technology (NIST) with assistance from the American Society for Quality (ASQ). Applicants undergo an extensive four-part selection process that includes multiple, detailed audits; team site visit evaluations; and a final panel review to determine how they rate on the 20 award criteria across seven categories: leadership; strategic planning; customer and market focus; information and analysis; human resource development and management; process management; and business results.

Whereas the current ISO 9000 is a system of quality standards for the purpose of establishing conformance, the Baldrige Award seeks to promote successful quality strategies that are thought of as essential to maintaining and increasing the competitiveness of American companies in the global marketplace. The Award and its criteria are intentionally designed to be educational rather than prescriptive, so as to encourage innovation. As a result, many companies not only seek to win this award, but also actually use the Baldrige Award criteria and core values to evaluate where they stand with respect to other businesses and assist in developing and implementing new business strategies. Those who have studied and learned from the Baldrige Award program have cited increased productivity, a larger market share, and greater customer satisfaction as just a few of the benefits accrued from their participation.

B. DEMING APPLICATION PRIZE OF THE JAPANESE UNION OF JAPANESE SCIENTISTS AND ENGINEERS

The Deming Prize was created in 1951 by the Japanese Union of Scientists and Engineers (JUSE) in honor of Dr. W. E. Deming for his efforts in introducing the concepts of quality control, specifically statistical quality control, to Japan. Statistical quality control was presented to Japan during the post-World War II era as an essential means for Japanese economic reconstruction through the improvement of product quality and productivity and reduction of production costs. The Deming Prize, which actually refers to a series of three different prizes (the Deming Prize, Deming Application Prize, and Deming Application Award for Factory), recognizes an individual, a business/division, or a factory (depending on the specific prize) that has researched and disseminated knowledge on the subject of quality control or implemented successful quality control strategies.

C. PRESIDENT'S AWARD FOR QUALITY AND PRODUCTIVITY IMPROVEMENT

The Presidential Award for Quality (President's Award) was conceived in 1988 as a means of identifying and recognizing government organizations within the executive branch for successes and improvements in performance. The President's Award recognizes federal organizations for improving performance and providing high quality services through the efficient use of taxpayer dollars, while also promoting awareness and encouraging the sharing of best practices with regard to government management techniques.

The Office of Personnel Management (OPM) administers the program that annually bestows the President's Award and its related Quality Improvement Prototype Award. Applicants for the President's Award must be divisions or agencies of the executive branch and have at least 100 employees. The evaluation process involves a preliminary eligibility review by the OPM, a team evaluation, a group site visit inspection, and a final review by a panel of judges which then makes recommendations to the President for a final decision on the award recipients. Throughout the review, applicants are evaluated based on 24 award criteria across 7 categories: leadership; information and analysis; strategic planning; human resource development and management; process management; business results; and customer focus and satisfaction.

The President's Award, like the Baldrige Award, represents a nonprescriptive, educational approach to the promotion of quality and performance and is not a scheme for quality management system standard conformance, such as ISO 9000. This educational focus is reflected in the award criteria, which are based on 11 key values: customer-driven quality; leadership; continuous improvement and learning; employee participation and development; fast response; design quality and prevention; long-range view of the future; management by fact; partnership development; corporate responsibility and citizenship; and results orientation. It is not coincidence that the approach, award criteria, and underlying values of the President's Award parallel those of the Baldrige Award. The former is modeled as a federal government adaptation of the Baldrige Award's commitment to competitiveness and quality in the private sector.

D. GEORGE M. LOW AWARD: NASA'S QUALITY AND EXCELLENCE AWARD

The George M. Low Award (GML Award) is bestowed by the National Aeronautics and Space Administration (NASA) as the highest honor in the aerospace industry in recognition of quality, productivity, and performance. NASA believes that a successful U.S. aerospace program depends upon NASA's access to domestically produced products and services of high quality. The GML Award's three overriding goals are to 1) generate awareness of quality issues and their importance; 2) encourage U.S. businesses to adopt strategies that improve company quality and productivity, as well as U.S. competitiveness; and 3) create an arena in which successful quality strategies and techniques may be shared.

The GML Award may be pursued by any prime contractor or subcontractor with NASA that meets an established sales figure, number of employees, and other specific requirement criteria with respect to that portion of their business that relates directly to their work with and for NASA. Of those eligible, candidates are nominated annually to compete for a total of up to four awards representing two classifications (large and small businesses) and two categories (products and services). Once the preliminary nominations have been made, the NASA Strategic Enterprise GML Review Council determines 10 finalists. These companies then submit additional documentation with respect to nine award criteria over seven categories: 1) NASA contract performance and customer satisfaction, 2) NASA schedule, 3) NASA cost, 4) long-term organizational initiatives to respond to NASA's strategic aspirations, 5) leadership and continuous improvement, 6) innovative management and technology breakthroughs, and 7) items of special interest to NASA. Site visits are conducted and recommendations made to a GML panel of judges that selects the winners who are ultimately approved by the NASA Administrator.

Similar to other quality awards, the GML Award is not a scheme of quality management system conformance standards like ISO 9000. Instead, the award encourages knowledge sharing within the aerospace industry and strives to recognize those companies that have adopted strategies that foster quality and successes in NASA's programs. In general, the GML Award's criteria categories are much more broadly defined than those of the Baldrige and President's Awards, yet they are much more specifically focused since they evaluate only those companies involved in NASA contracts.

E. SHIGEO SHINGO PRIZE FOR EXCELLENCE IN MANUFACTURING

In 1988, the Shingo Prize for Excellence in Manufacturing (Shingo Prize) was established to recognize businesses that adhere to those ideals held by the prize's namesake, Shigeo Shingo, a leading expert on quality and improving the manufacturing process. The award's philosophy is that a business or manufacturer can compete successfully in the world market only if it systematically works toward continuous improvement of the core manufacturing process through such methods as lean manufacturing, just-in-time systems, waste reduction, and defect control. Accordingly, the Shingo Prize objectives are to 1) provide a forum for generating awareness of various manufacturing methods and systems in order to increase competitiveness; 2) encourage

the sharing of successful manufacturing strategies and methods; and 3) promote research on manufacturing processes and production among business leaders and in academia.

Administered by a partnership between the College of Business at Utah State University and the National Association of Manufacturers (NAM), the Shingo Prize selects winners annually from a nomination pool of large and small manufacturers from the United States, Canada, and Mexico. The evaluation process includes the individual and joint reviews of nominees' "achievement reports" by several members of the Board of Examiners, site visits by five to six examiners, and the final review and ratification by the Shingo Prize Council. The manufacturers are evaluated on the basis of strategy/implementation and results dimensions with regard to 10 key criteria across 4 categories: total quality and productivity management culture and infrastructure; manufacturing strategy, processes, and systems; measured quality and productivity; and measured customer service. In addition to rewarding manufacturers for quality successes, the Shingo Prize program furthers its educational/knowledge sharing goals by awarding a Shingo Prize for research and professional publication in the areas of manufacturing quality, productivity, and process improvement.

F. AWARDS PROGRAM COMPARISONS

1. Process Criteria

Table III-1 compares the process criteria of the five quality awards programs described in this chapter with the Malcolm Baldrige criteria, the baseline.

2. Auditor Criteria

Of the quality award's reviewed for this report, the Baldrige Award was the only program to explicitly outline the details of the process required to become an auditor. In general, Baldrige Award auditor applicants are expected to possess formal educational and practical experience related to quality and methods for continuous improvements. Auditors are evaluated for the Baldrige program based on several factors: 1) their depth of experience with the issues and concepts represented by the seven results criteria categories of the Baldrige Award; 2) their diversity of experience as shown in experience across different economic sectors and/or industries; 3) a demonstration of leadership qualities and the ability to communicate effectively in written form or verbally;

Table III-1. A Comparison of Quality Awards' Criteria: Process Criteria (page 1 of 2)

Quality Awards	Application Independently Reviewed by Six Examiners and Panel of Judges Determines Who Goes Forward	Application Jointly Reviewed by Six Examiners and Panel of Judges Determines Who Goes Forward	Site Visits by at least 5 Examiners and 1 Senior Examiner and Site Report Submitted to the Panel of Judges
Baldrige Award			Site visits conducted
Deming Prize	Not addressed	Review and decisions on who advances made by the Deming Prize Examining Committee	Site visits conducted
President's Award	Not addressed	Review and decisions on who advances made by the Examiner Teams	Site visits conducted
George M. Low Trophy	Not addressed	Reviewed by NASA Strategic Enterprise GML Review Council and the GML Validation Board, the latter determining who advances	Site visits conducted
Shingo Prize	Not addressed	Review and Decisions on who advances made by the Board of Examiners	Site visit and review conducted by the Board of Examiners

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Table III-1. A Comparison of Quality Awards' Criteria: Process Criteria (page 2 of 2)

Quality Awards	Final Review and Recommendations Made by the Panel of Judges	Final Determination Made by the Secretary of Commerce	3-Dimension Scoring System (Approach, Deployment, and Results)	5-Part Scoring Guidelines	Feedback Report
Baldrige Award					
Deming Prize	Not addressed	Final decision made by the Deming Prize Committee	Not addressed	Not addressed	Not addressed
President's Award		Final decision made by President			
George M. Low Trophy	Validation board makes recommendations and Panel of Judges selects winners	Winners approved by NASA Administrator	Not addressed	Not addressed	Not addressed
Shingo Prize	Recommendations made by Board of Examiners	Recommendations ratified by Shingo Prize Council	Only 2 dimensions: Strategy/Implementation and results	Only 4-level scoring guidelines	Not addressed

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Text explains deviations from the ISO 9000 definition.

4) knowledge of quality concepts and their relation to processes and results; and 5) the two references provided. Applicants selected for consideration must attend a 3-day course that familiarizes them with the specific criteria, evaluation system, site visit procedures, etc., of the Baldrige Award. Furthermore, the applicants will undergo a 20- to 40-hour evaluation of their performance during a quality case study. The evaluation process for identifying Baldrige Award auditors takes place on an annual basis, with roughly a third of the auditors being replaced each year in order that the auditor pool may reflect the diversity of business size and sectors.

The Deming Prize takes a much less formal assessment approach in identifying its auditor pool since the Deming Prize committee members are appointed to their unpaid positions by the committee's chair, who is also the President of the Japanese Union of Scientists and Engineers. The committee members are chosen to draw individuals of differing backgrounds, including government, media, and business.

The President's Award is closely linked to the Baldrige Award in the structure of its results and process criteria, but very little is detailed on the process required to become an auditor of this program. The selected auditors are, however, representative of both public and private sector organizations.

The GML Award assembles its pool of auditors and reviewers from existing representatives of the strategic enterprises and the NASA headquarters office.

Auditors for the Shingo Prize are representative of business, government, and academia. These individuals possess knowledge of manufacturing and its related processes, systems, and methods for improvement. The Shingo Prize program, like Baldrige, does provide formal training to its auditors.

3. Results Criteria

Table III-2 compares the results criteria using the 1997 Baldrige Award criteria as the baseline. Numbers in the table refer to criteria sections in the award or prize document.

Table III-2. A Comparison of Quality Awards' Criteria: Results Criteria (page 1 of 7)

<i>Quality Awards</i>	<i>Leadership System</i>	<i>Company Responsibility and Citizenship</i>	<i>Strategy Development Process</i>
	Effective leadership given stakeholder needs: how senior leaders set company direction for future; leadership system and how values/direction/performance are integrated; how leaders communicate and reinforce these; and how leaders review company's overall performance	How company addresses responsibility to public: how company addresses current and future impacts on society of its products and services and how the company anticipates public concerns and how to proactively address; how company and employees support and strengthen community	How strategy developed: how company develops strategy given target customers; market requirements; expectations; new opportunities; competitive environment; risks; company capabilities; supplier/partner capabilities; how strategy translated into action plans
Baldrige Award	1.1	1.2	2.1
Deming Prize	Not addressed	Not addressed	1
President's Award	1.1 and 1.2	1.3	3.1
			In addition, the President's Award also reviews how an organization evaluates and improves its strategic planning processes
George M. Low Trophy	4.1	Not addressed	1.1
Shingo Prize	1.1	1.3	2.1
		Deals more with company's efforts to build relations with the community	Additional information required on how strategy impacts selection and use of methods, systems, and processes

Notes: The criteria and categories for the George M. Low Award are more broadly defined than those of the Baldrige Award, but are also more specific in that they deal exclusively with business as related to NASA.

The criteria and categories of the Shingo Prize appear to only partially address the extensive ground covered through the Baldrige Award criteria.

Table III-2. A Comparison of Quality Awards' Criteria: Results Criteria (page 2 of 7)

<i>Quality Awards</i>	<i>Company Strategy</i>	<i>Customer and Market Knowledge</i>	<i>Customer Satisfaction and Relationship Enhancement</i>
	Summarize company strategy and action plans and how deployed: performance requirements and key per-formance measures; key human resource plans (work design; employee development; changes in company; recruitment); 2- to 5-year projection of key performance measures	How company determines long-term requirements of customers/markets: how customer/markets are determined; how product and services' value to customer is determined; and how company listens and learns from customers/markets and how this information is used	How company determines/enhances customer satisfaction: how company provides customers with access to information; how customer contact requirements are determined; company complaint management process; how customer satisfaction determined
Baldrige Award	2.2	3.1	3.2
Deming Prize	1	Not addressed	Not addressed
President's Award	3.2	7.1	7.2 and 7.3
George M. Low Trophy	1.1, 4.1	1.2	1.2
		The only customer of concern for the GML Award is NASA and there is no emphasis on market knowledge in general	Information required only as it relates to NASA and its relationship with the nominated contractor
Shingo Prize	Not addressed	Not addressed	1.3
			Deals with company's interface with customers to increase quality, productivity and satisfaction

Notes: The criteria and categories for the George M. Low Award are more broadly defined than those of the Baldrige Award, but are also more specific in that they deal exclusively with business as related to NASA.

The criteria and categories of the Shingo Prize appear to only partially address the extensive ground covered through the Baldrige Award criteria.

Table III-2. A Comparison of Quality Awards' Criteria: Results Criteria (page 3 of 7)

<i>Quality Awards</i>	<i>Selection and Use of Information and Data</i>	<i>Selection and Use of Comparative Information and Data</i>	<i>Analysis and Review of Company Performance</i>
	Company selection and use of information and data to support key processes and improve performance: main financial and nonfinancial information and how relates to processes and goals; how information is deployed to users to meet goals; how user requirements are met; and how process improved	Company selection and use of comparative data to improve performance and competitiveness: how needs for comparative information are determined; criteria for seeking comparative data; how used to encourage performance breakthroughs; how used in changing times	How company reviews overall performance and identifies improvement areas: how customer-related/operational/competitive/financial and market performance data is analyzed; how performance is assessed relative to goals, plans, changing needs
Baldrige Award	4.1	4.2	4.3
Deming Prize	4.1	Not addressed	Not addressed
President's Award	2.1	2.2	2.3
George M. Low Trophy	Not addressed	Not addressed	Not addressed
Shingo Prize	Not addressed	Not addressed	3.1 and 3.2 Company provides explanation of the formula or method used to determine quality enhancements and productivity improvements achieved

Notes: The criteria and categories for the George M. Low Award are more broadly defined than those of the Baldrige Award, but are also more specific in that they deal exclusively with business as related to NASA.

The criteria and categories of the Shingo Prize appear to only partially address the extensive ground covered through the Baldrige Award criteria.

Table III-2. A Comparison of Quality Awards' Criteria: Results Criteria (page 4 of 7)

<i>Quality Awards</i>	<i>Work Systems</i>	<i>Employee Education, Training and Development</i>	<i>Employee Well-Being and Satisfaction</i>
	How work design and compensation encourage employee to contribute to company performance and goals: Designed for initiative, flexibility, cooperation, rapid response, learning and effective communication; how compensation reinforces overall work system/objectives	How education and training addresses key company plans and needs: how it addresses key performance plans; designed to support company approach to work; how it is delivered; how evaluated and improved	How company maintains work environment to support well-being, satisfaction and motivation: how safe and healthful environment maintained; how company supports employee satisfaction, motivation and well-being; how these are determined for the employee and related to business results
Baldrige Award	5.1	5.2	5.3
Deming Prize	Not addressed	3	Not addressed
President's Award	4.1 and 4.2	4.3	4.4
George M. Low Trophy	Interested in how workforce design lends itself to higher performance	Not addressed	Not addressed
Shingo Prize	1.2 Concerned with how work is organized and what resources exist to empower workers and assist in realizing organizational objectives	1.2 Searches for the links between education and training and increased productivity and quality improvements	1.3 Concerned with partnering with employees to ensure their health and safety

Notes: The criteria and categories for the George M. Low Award are more broadly defined than those of the Baldrige Award, but are also more specific in that they deal exclusively with business as related to NASA.

The criteria and categories of the Shingo Prize appear to only partially address the extensive ground covered through the Baldrige Award criteria.

Table III-2. A Comparison of Quality Awards' Criteria: Results Criteria (page 5 of 7)

<i>Quality Awards</i>	<i>Management of Product and Service Processes</i>	<i>Management of Support Processes</i>	<i>Management of Supplier and Partnering Processes</i>
	How new, modified, and customized products and services are designed; how changing customer requirements are incorporated; how processes coordinated for trouble-free introduction; how managed to maintain process integrity; how evaluated/improved for better performance	How company key support processes designed/managed/improved to meet current and future requirements: how set with internal and external input; how support processes designed to meet overall performance requirements; how processes managed/evaluated/improved for better performance	How company supplier/partnering processes, relationships, performance are managed/improved: how these processes are designed to meet performance requirements; how to ensure that requirements are met; how company evaluates/improves its management of supplier/partnering processes for better performance
Baldrige Award	6.1	6.2	6.3
Deming Prize	Not addressed	Not addressed	Not addressed
President's Award	5.1 and 5.2	5.3	5.4
George M. Low Trophy	Not addressed	5 Addresses any process improvements undertaken by a contractor to improve various aspects of their products and services	5 Touches upon the contractor's relationship with subcontractors on issues such as quality and improving performance
Shingo Prize	Not addressed	Not addressed	1.3 Also relates to partnering with employees, community and government

Notes: The criteria and categories for the George M. Low Award are more broadly defined than those of the Baldrige Award, but are also more specific in that they deal exclusively with business as related to NASA.

The criteria and categories of the Shingo Prize appear to only partially address the extensive ground covered through the Baldrige Award criteria.

Table III-2. A Comparison of Quality Awards' Criteria: Results Criteria (page 6 of 7)

<i>Quality Awards</i>	<i>Customer Satisfaction Results</i>	<i>Financial and Market Results</i>	<i>Human Resource Results</i>
	Customer satisfaction and dissatisfaction results: current and future levels of consumer satisfaction plus that relative to competitors	Company key financial and marketplace performance results: aggregate measures of financial return/economic value; market share; business growth and new markets plus that relative to competitors	Company human resource results: current and future measures for well-being, satisfaction, development, work system improvement and effectiveness plus that relative to competitors
Baldrige Award	7.1	7.2	7.3
Deming Prize	Not addressed	Not addressed	Not addressed
President's Award	7.4	6.2	6.3
		Focus is on current and trend measures for operational and financial performance, but little emphasis on specific measures for market results	
George M. Low Trophy	Not addressed	Not addressed	Not addressed
Shingo Prize	4.1 Requires 3 years of results, but without any forecasting and/or comparison to competitors	Not addressed	Not addressed

Notes: The criteria and categories for the George M. Low Award are more broadly defined than those of the Baldrige Award, but are also more specific in that they deal exclusively with business as related to NASA.

The criteria and categories of the Shingo Prize appear to only partially address the extensive ground covered through the Baldrige Award criteria.

Table III-2. A Comparison of Quality Awards' Criteria: Results Criteria (page 7 of 7)

<i>Quality Awards</i>	<i>Supplier and Partner Results</i>	<i>Company Specific Results</i>
	Company supplier and partner performance: current and future measures to include cost/performance improvements attributed to supplier and partner performance plus that relative to competitors	Company key operational performance results that contribute to key goals: product and service quality and performance; key process performance; productivity; cycle time; regulatory/legal compliance—current and future measures plus that relative to competitors
Baldrige Award	7.4	7.5
Deming Prize	Not addressed	Not addressed
President's Award	6.4	6.2
George M. Low Trophy	Not addressed	2, 3 and 6 Criteria ask for processes and measures of scheduling, costs, etc. as a way to evaluate a contractor's performance with regard to its work for and with NASA
Shingo Prize	Not addressed	3.1 and 3.2 3 years of data for each measure defined to enhance quality and increase productivity, but no future forecasting or comparison to competitors

Notes: The criteria and categories for the George M. Low Award are more broadly defined than those of the Baldrige Award, but are also more specific in that they deal exclusively with business as related to NASA.

The criteria and categories of the Shingo Prize appear to only partially address the extensive ground covered through the Baldrige Award criteria.

IV. PAST PERFORMANCE PROGRAMS

This research effort initially set out to compare programs that assess contractors' quality systems and supplier quality in general. We found, however, that some elements of past performance programs could pertain to our consideration of reciprocal agreements and decided to examine past performance programs as well. For example, the Navy's Red/Yellow/Green Program has a reciprocal agreement with the Coordinating Agency for Supplier Evaluations (C.A.S.E.), a nonprofit corporation that promotes cost savings through the reduction of redundant supplier audits and assessments. C.A.S.E. uses an extensive data base for sharing nonprejudicial supplier information, and data bases are important factors for keeping past performance information as well.

A. DoD POLICY

When ordinary customers make purchase decisions in the marketplace, they consider their history with merchants or suppliers. Similarly, a 13 October 1994 executive order signaled that the government would increase its emphasis on the past performance of contractors. In 1996, the Department of Defense (DoD) announced that it would look beyond cost considerations to consider such additional factors as price, quality, delivery performance, and service in considering all its acquisition activities over a certain dollar threshold. With that mandate, the past performance of a contractor became a vital criterion in the determination of a DoD contract award.

According to a 17 June 1996 report by Arthur D. Little, Inc., 35 systems existed across DoD and its components dealing with past performance information (PPI). These PPI systems lacked uniformity, however, especially in their approach to the collection and use of PPI. In order to design and implement a more uniform PPI approach that would address the specific needs of DoD as a whole and its unique business areas, an Integrated Product Team (IPT) was established in February 1997. This Past Performance IPT's focus was the promotion of joint endeavors between component and civilian agencies and the use of electronic data bases for the collection and dissemination of PPI data.

The IPT has since defined the business areas encompassed by DoD and the past performance factors associated with each of these areas. This approach mirrors that expounded in the Little report, which, because of the sheer size and diversity of the defense business, argued that DoD-related business areas should be defined along with their corresponding strategies and evaluations. By approaching the simplification and improvement of DoD's PPI collection and use at the business area rather than departmental level, the IPT ensured that a business area would have access to the contractor past performance data necessary to make informed contract awards.

In a 20 November 1997 memorandum, the Under Secretary of Defense for Acquisition and Technology, Dr. Jacques Gansler, announced the creation of a policy refinement to the Federal Acquisition Regulation (FAR) Parts 15, 19, 42 and the Defense Federal Acquisition Regulation Supplement (DFARS) Part 36. This policy change, effective 1 February 1998, states that DoD shall use a consistent management approach for the collection and use of PPI. This approach includes contract dollar thresholds tailored by business sector, an established set of contractor assessment elements, and an element rating system. The five-level assessment rating system applies to all business sectors, except Construction and Architect-Engineering, and is to be used in completing report cards for all PPI assessment elements. Since the existence of an automated system for the collection and retrieval of PPI is key to the success of this policy's implementation, the Life Cycle Information Integration Office has been tasked to conduct a pilot effort to identify the current DoD PPI interfaces and show the ability to integrate PPI collection efforts. A plan for the automation of the PPI collection and retrieval process within DoD is to be presented to the USD(A&T) on 30 March 1998.

In the meantime, however, several existing past performance systems are worthy of further investigation. These systems include the Air Force's Contractor Performance Assessment Reporting System, the DoD-wide Deficiency Reporting System, the Navy's Product Deficiency Reporting and Evaluation Program, and the Navy's Red/Yellow/Green Program.

B. CONTRACTOR PERFORMANCE ASSESSMENT REPORTING SYSTEM

The Contractor Performance Assessment Reporting System (CPARS) is the Air Force mechanism for appraising contractors based on their past performance. The CPARS is a data base containing background information and contractor performance evaluations on an ongoing basis. Through this system, each contractor's strengths and

weaknesses are highlighted by specific performance measurement data and project managers' narrative assessments of contractor performance. Furthermore, each contractor is assigned an overall, color-coded performance rating (blue—exceptional; green—satisfactory; yellow—marginal; or red—unsatisfactory) within CPARS.

CPARS is used in major Air Force acquisitions of more than \$5 million. Government personnel involved in acquisition activities retrieve information from CPARS when evaluating contractors during the source selection process. In addition to providing background on the contractor's program and efforts, CPARS gives, for each of a contractor's contracts, the contractor's evaluation rating, which is based on numerous measurement elements: product and system performance, cost performance, product assurance, testing and evaluation, the responsiveness of management, and the management of subcontractors.

The CPARS involves the generation of a series of reports. An initial report is mandatory for new contracts and provides an evaluation of a contractor's performance during at least the first 180 days of a contract. Intermediate reports are then required on an annual basis throughout the duration of the contract. Occasionally, an out-of-cycle report will be deemed necessary by a program manager in order for the contractor's evaluation to reflect any significant performance changes that have occurred since the previous report. At the completion of a contract, through the delivery of the contracted item, the transfer of authority for a program's management, or a contract termination, a final report that details the contractor's performance since the most recent report is released.

Contractors may access their own measurement data and evaluation information contained in CPARS. Contractors can review and comment on their evaluations through CPARS. They may also use the CPARS information as valuable performance feedback in their efforts to identify areas in which further improvements are needed.

C. DEFICIENCY REPORTING SYSTEM

The Deficiency Reporting System (DRS) was designed as a DoD-wide system for reporting complaints and corrective actions associated with contract shortages, overages, and the use of incorrect material. The DRS is an attempt to simplify the process through which action officers receive information regarding a contract's deficiencies or discrepancies.

The DRS combines data received across DoD through the use of several existing reports, such as Reports of Discrepancy (ROD), Product Quality Deficiency Reports (PQDRs), and Transportation Discrepancy Reports (TDRs). The DRS is also integrated with existing systems for the collection of specific data related to contractor deficiencies and complaints. These systems include the Stock Control System (SCS), the Provisioning and Cataloging Technical Support System (PCTSS), Depot Maintenance Systems (DMS), and Standard Procurement System (SPS).

When a complaint is lodged by a customer against a DoD contractor, this information is routed into the DRS. Once received, the discrepancy or deficiency outlined in the complaint is evaluated and a corrective action is devised. Corrective actions are implemented, any discrepant or deficient materiel is identified, and steps are taken to ensure its appropriate disposal. Furthermore, the DRS provides an opportunity to measure and analyze deficiency and discrepancy trends for DoD contractors.

D. PRODUCT DEFICIENCY REPORTING AND EVALUATION PROGRAM

The Product Deficiency Reporting and Evaluation Program (PDREP) was established in the mid-1980s as the Navy's centralized system for data on contractors' past performance, specifically with regard to product quality. The PDREP is an automated system focused on the quality and delivery performance of the Navy's procurement activities. Components of the PDREP include a data base of past performance data, profiles on contractor performance, and a system for evaluating contractors.

Data for inclusion in the PDREP is collected at the materiel level. An individual contractor's evaluation is then based on the aggregate of the past performance data collected on that contractor's products for each applicable materiel category. Purchasing officers, inspectors, and quality assurance personnel may access this information through standard or individualized reports to aid in the source selection process of contract awards.

The PDREP gathers its contractor data through a diverse array of means, including Product Quality Deficiency Reports (PQDRs), Material Inspection Records (MIR), surveys, testing reports, Contract Delivery Data (CDD), and requests for corrective action. This data is collected from the Systems Commands and updated on a daily basis.

E. RED/YELLOW/GREEN PROGRAM

The Red/Yellow/Green Program (RYG) was created by the U.S. Navy as a means of addressing Section 9.104-3c of the Department of Defense FAR Supplement, which addressed *quality* as an important element when reviewing a contractor's past performance or selecting a contractor for present or future contracts. The RYG is a series of procedures and a computerized system for assigning red, yellow, and green classifications to a contractor's Federal Supply Classifications (FSC), which can then be utilized in the source selection process. The importance of a specific contractor's quality history is therefore emphasized, as the RYG provides the means with which to include the cost of receiving and maintaining poor quality goods and services during source selection.

The RYG is open to any contractor involved in materiel procurement contracts with the Navy. The program does not classify contractors, but rather contractors' quality performances with respect to individual FSCs. A single contractor can therefore receive varying classifications at any one time depending on the quality status of its FSCs. The RYG relies upon data collected from contractors and maintained in the Navy's Contractor Evaluation System (CES) and the Product Deficiency Reporting and Evaluation Program (PDREP). Every month, the RYG accesses these data bases and uses the data to classify each contractor's FSCs on the basis of risk to the government if poor quality products are received (red—high risk; yellow—moderate risk; green—low risk; neutral—insufficient data). On a monthly basis, the contractors are then apprised of their RYG classifications and provided the opportunity to challenge the results.

The RYG is considered a source selection enhancement program since it allows the Navy to review and assess quality data that can then be used in the procurement selection process. The RYG classifications are used in conjunction with two equations that assist in factoring quality issues into the contract award process: Technical Evaluation Adjustment (TEA) and Greatest Value/Best Buy (GV/BB). The TEA is actually a formula that allows a contracting officer to determine the costs to government of having to implement additional quality assurance actions associated with a contractor's RYG classification for a particular FSC. The GV/BB provides yet another means to add RYG classifications to price as evaluation factors in the contract award decision-making process.

V. ESTABLISHING RECIPROCAL AGREEMENTS

The formation of reciprocal agreements to eliminate costly redundant audits of quality systems is facilitated when those systems are similar across a wide range of companies. The defense industrial base, however, has a range of systems for assuring quality. A previous IDA study quoted a 1989 Defense Contract Management Command (DCMC) review that determined that, of the plants in which DCMC performed in-plant quality assurance activities, 800 facilities met the old MIL-Q-9858, *Quality System Requirements*; 7,200 facilities met MIL-I-45208, *Inspection System Requirements*; and 8,000 facilities worked to the simple standard inspection clause.¹ Much has changed since the time of that review. MIL-I and MIL-Q have been canceled, and DoD policy under Acquisition Reform and the Single Process Initiative is to allow each contractor facility to use the single quality system that best meets its customers' needs. Although the current trend is to move toward process controls and away from end-item inspection in managing product quality, the cost of changing their quality system is an issue for many contractors.

A May 1997 report of the precision gear industry published the findings of a study that discusses this cost issue, assesses the feasibility of a Common Quality Certification System (CQCS), and recommends how to proceed in developing such a system. We begin by summarizing that report, which provides some specific guidance on reciprocity in auditing and certifying suppliers. We then describe two existing reciprocal agreement organizations and the quality system assurance process for NATO countries. We conclude with a description of current DoD policy and a recommendation from the Government and Industry Quality Liaison panel (GIQLP).

A. COMMON QUALITY CERTIFICATION SYSTEM REPORT

In May 1997, the IIT Research Institute published a study report, "Common Quality Certification System," in which it assesses the effect of Defense Acquisition

¹ Karen J. Richter and Seymour J. Lorber, *New Quality Assurance Practices*, IDA Paper P-2991, August 1994.

Reform on the aerospace precision gear industry, specifically with regard to quality and specification reform. The report, which was done for the U. S. Army Aviation and Troop Command's Instrumented Factory for Gears (INFAC), explores six basic questions and recommends whether and how to proceed in developing a Common Quality Certification System (CQCS).

1. CQCS Study Approach

The study approach included research, interviews, and analysis. The effort began with research on Defense Acquisition Reform, the Single Process Initiative, and other related quality and specification issues. Interviews were then conducted with seven companies representing all levels of the aerospace precision gear industry to assess their experience with quality systems and certification. The results of the research and interviews were analyzed to answer the established project questions, summarized below.

1) *What impact has the change from military to commercial specifications had on manufacturing processes?* The conversion from military to commercial specifications has brought about a parallel shift in quality's emphasis from inspection to process control. Although inspection does remain a valuable quality system component, its emphasis has diminished. Quality systems, in general, have moved from their traditional reactive approach to become more proactive.

2) *Are the commonly identified quality cost drivers valid?* The study confirmed quality's major cost drivers to be the conduct of many audits, requiring labor and paperwork expenditures; oversight; and the expense of time and labor necessary to remain current on government specifications and their changes. One company reportedly expended over \$100,000 annually and as many as 77 days to conduct just the external assessment phase of certification. Companies seemed to indicate that a CQCS could alleviate some of these costs, but also cautioned that there would be little in the way of cost savings, especially to pass along to the customer, at least in the short term. Quality system certification is a time-consuming and expensive process, which includes not only the external cost of audits, but also the internal costs expended in preparing for the audit. Indeed, in considering internal costs, one company estimated that it takes anywhere from 1 to 2 years of work by an engineer or manager to prepare a company for a certification audit.

3) *What are the risks in replacing military specifications and standards with alternative quality methods?* None of the companies interviewed indicated that they

associated any risk with using quality system methods other than military specifications. They did, however, express some apprehension on two grounds. First, ISO 9000 does not contain all the requirements detailed in the military specifications; thus, suppliers might sacrifice some aspects of quality in order to compete for lowest bidder status in the awarding of contracts. Second, ISO 9000 might not meet all the requirements for a CQCS.

4) *What contrasts and comparisons may be drawn in assessing commercial and DoD aerospace gear quality practices and certification systems?* Most of the companies have implemented a single quality system. These systems are most often based upon military specifications or ISO 9000 and are enhanced by additional quality requirements to address the needs of their most stringent customers.

5) *What key quality characteristics and processes are involved?* The companies cited heat treatment, materials, blueprint requirements, gage calibration, power system design, etc.

6) *What characteristics are necessary to develop a military and commercial quality and certification system?* A CQCS should approach quality from a process orientation, but should also integrate product inspection requirements. During the definition phase, such a system should look to ISO 9000's 20 criteria and its 8 Basic Quality Principles (customer-focused organization; leadership; involvement of people; process approach; system approach to management; continual improvement; factual approach to decision making; and mutually beneficial supplier relationships).

2. CQCS Study Recommendations

The report recommends specific approaches to developing a CQCS.

- 1) Initially define the CQCS based on ISO 9000's 20 criteria and 8 Basic Quality Principles to create a quality system and certification that emphasizes process control while also recognizing the importance of the limited but efficient use of inspection.
- 2) Encourage companies to aid their process control procedures by defining and confirming their key product and process characteristics. Because ISO 9000 will likely represent the basis for the development of a CQCS, U.S. companies should seek to play a more active role in the U.S. technical advisory group to the ISO technical committee, which develops and maintains the ISO standards.

- 3) Make the CQCS applicable at all supplier levels. Primes therefore need to undertake efforts to reduce the redundancies and foster reciprocity in the auditing and certification of their own suppliers. Also, the primes need to agree on criteria and encourage reciprocity in the audit and certification of their suppliers. Otherwise, a CQCS will provide inconsistent benefits to the industry as a whole.

B. EXISTING INDUSTRY RECIPROCAL AGREEMENT ORGANIZATIONS

Two national organizations promote reciprocal recognition of quality audits among their members—the Coordinating Agency for Supplier Evaluations, or C.A.S.E., and the National Aerospace and Defense Contractors Accreditation Program, or NADCAP. C.A.S.E. members have access to all data from audits performed by another member. NADCAP members use the Performance Review Institute (PRI) for all audits. In both organizations, members maintain control over the criteria and requirements of the audits and the auditors.

1. Coordinating Agency for Supplier Evaluations

C.A.S.E. is a nonprofit, mutual benefit corporation whose purpose is to “promote the improvement of quality and the reduction of costs in industry for the benefit of major government and industrial contractors and their respective customers and sources of supplies and services.” It is a coalition of industrial companies dedicated to—

- Exchanging and publishing non-prejudicial supplier data
- Reducing redundant supplier audits or assessments
- Standardizing supplier and procurement quality practices
- Reducing supplier management costs through expense avoidance

a. Organization Description

C.A.S.E. is governed by a Statement of Principles and Bylaws. C.A.S.E. management consists of a voluntary Board of Directors with elected and appointed officers. The president and vice president are from the Board and elected by it. The Board appoints the executive director, secretary, and treasurer.

C.A.S.E. has two types of members—sustaining and associate. Sustaining members have voting rights and the rights to receive data about the evaluated sources of supply published in the C.A.S.E. data base. Associate members can also receive the

C.A.S.E. data base but have no voting rights. A sustaining member, upon reviewing the data base about a prospective supplier, can submit a request for data directly from the sustaining member who performed the audit. C.A.S.E. coordinates the request.

The organization is divided into sections representing specific industrial sectors. Section chairs and vice chairs are elected officers. Section activities include the following, when appropriate.

- Sharing data, including supplier quality and process or commodity assessment information
- Developing and adopting standard assessment criteria based on the quality systems, processes, and commodity specifications used within that industry
- Pooling assessment activities of shared suppliers, eliminating redundant effort, or conducting joint assessments of large, critical suppliers, reducing a single member's effort and cost
- Developing and adopting training requirements, standards, and programs for their auditors
- Developing standards for auditor qualification and certification
- Agreeing to certify their auditors and assessors to the developed criteria
- Sharing supplier base management practices and techniques and encouraging benchmarking

The Aerospace/Marine Systems section, which has many defense contractor members, has a Source Certification Committee that is responsible for preparing and revising the Supplier Quality System Evaluation Checklists to assure standardized methods. Each supplier must be reevaluated annually to remain in the data base, and an on-site survey must be conducted every 3 years. They recognize that—

In accepting supplier evaluations (audits/surveys) performed by others, the person(s) who accomplish the evaluation must have established integrity and credibility through demonstrated proficiency. To support a standard level of performance and adherence to prescribed procedures, it is fundamental that minimum requirements for aerospace quality system evaluation personnel be defined. A baseline standard that outlines auditor qualification/certification is described in the Systems Procedure Manual for the Section to enable members and their customers to mutually accept another member's survey results. These minimum requirements are not

solely directed at various personnel characteristics but also at the training and records for verification.²

Auditors must accrue 10 of a possible 17 credits (described below), demonstrate communication skills, and satisfy other requisites such as written and/or oral exams, audit participation, and auditor training courses. Credits accrue from—

- Education: four credits maximum, based on type of degree achieved
- Experience: nine credits maximum, based on professional, quality assurance, and quality auditing experience
- Professional accomplishment: two credits maximum, based on certification or registration achieved
- Management evaluation: two credits maximum, based on auditor's employer's evaluation.

b. Supplier Performance Information Network

The corporation maintains a C.A.S.E. Data Center, which is the computer system for collecting, collating, publishing, and distributing supplier information, including the Supplier Performance Information Network (SPIN). SPIN, accessed over the internet, provides interactive access to the data base of suppliers shared by the C.A.S.E. members. The data base includes product designation (simple or complex), identification of the quality system evaluated, supplier system qualifications by product/process codes, indication of an on-site survey or performance update, the sustaining member who performed the evaluation, and when the audits or assessments were performed. The assessment results detail the system level or process technique for which the supplier was approved. SPIN is available only to authorized users who are employees of a participating C.A.S.E. member or supplier. Security is maintained through five levels of access. Once authorized users have access, they can view profile information about their company; profile information of other C.A.S.E. member companies; and archived, submitted, or current C.A.S.E. supplier profile or assessment information. Users can then submit a request to add, modify, or remove C.A.S.E. supplier profile or assessment information. They can also submit a request to modify the list of supplier capabilities that they use.

² Aerospace/Marine Systems Procedure, 17 October 17 1995.

SPIN also provides access to demographic information from suppliers of member industries. These suppliers are considered to be approved sources when a registered member has assessed them. C.A.S.E. makes it clear, however, that "lack of approval should not be considered a reason not to utilize the supplier as an industry source. C.A.S.E. member goals include the desire to approve all shared suppliers."³

The Chair of the Electronics and Computer Section of C.A.S.E. describes the following benefits of sharing in a supplier performance data base:⁴

- Access to hundreds of supplier performance assessments
- Greatly increased knowledge of supplier business and technical process and performance
- Assessment expenses minimized
- Greater in-depth assessments
- Standardized assessments
- No lost or misplaced assessment documentation
- Quick identification of key company and supplier contacts
- Quick connection to all member companies and associated supplier profiles and home pages
- Opportunity to work with C.A.S.E. membership to enhance their data base strategy.

c. Reciprocal Agreements

In the winter of 1997, C.A.S.E. and the Naval Sea Logistics Center Detachment Portsmouth (NAVSEALOGCENDETPTSMH), the Naval Material Quality Assessment Office (NMQAO), signed a Memorandum of Agreement (MOA) to form a partnership to exchange contractor data between C.A.S.E. and the Navy's Red/Yellow/Green program (see section IV.D). Sharing data bases is a type of recognition by our definition. Boeing also has this type of arrangement with C.A.S.E. The following industry best practice illustrates TRW's use of the C.A.S.E. register for full reciprocity by the definition we use in this report.

³ C.A.S.E. homepage, <http://www.caseinc.org>

⁴ Bruce K. Short, Engineering Manager of Digital Equipment Corporation and Chair of Electronics and Computer Section of C.A.S.E., white paper, "Benefits from Sharing in a Supplier Performance Data Base."

TRW's approach to supplier certification is based directly on the ISO 9000 series. Indeed, just like ISO 9000, TRW has created a quality assurance series rather than an individual standard. This QSA-9000 series consists of three versions, QSA-9001, QSA-9002, and QSA-9003, which deal with different functional areas. Suppliers complete the relevant QSA-9000 checklist indicating their current level of compliance with the established criteria (the 20 basic ISO 9000 criteria). Corrective actions are to be designed and implemented for any noted deficiencies. In addition to having suppliers go through this QSA-9000 assessment process, TRW maintains a database of the results called the Quality Assurance Supplier Directory. A supplier's compliance to QSA-9000 is proven through one of three ways, although TRW always reserves the right to require additional technical and product capability audits: 1) certification of ISO 9000 compliance by a third party registrar; 2) inclusion in the C.A.S.E. register; or 3) determination of QSA-9000 compliance through a formal audit or self-assessment.

The Air Carrier section of C.A.S.E. has had the greatest success in reducing redundant audits. C.A.S.E. identified roughly 4,300 redundant audits among the 5,200 scheduled audits of the Air Carrier members. The Air Carriers section reduced the number of audits among the members to just over 500 for 1997. However, unlike defense contractors and the Aerospace and Marine Section members, Air Carriers provide essentially one service and share the burden of a common FAA-mandated standard for supplier surveillance. For the Aerospace and Marine Section members, the task of reducing redundant audits is somewhat more complicated: They make many different products for both government and commercial customers and their suppliers work to many different quality system standards. Their goal of reducing redundant audits is, however, the same as for the Air Carriers.⁵

2. National Aerospace and Defense Contractors Accreditation Program

The National Aerospace and Defense Contractor Accreditation Program (NADCAP) is an industry-driven supplier accreditation program developed by representatives from aerospace prime contractors and government agencies with the support of their supplier base. NADCAP's purpose is to reduce the number of redundant quality systems audits that are being performed on suppliers.

⁵ "The Case SPIN database: A who's who of quality audits," *Purchasing*, 17 July 1997, pp. 39-42.

a. Organization Description

The Performance Review Institute (PRI), a nonprofit trade association affiliated with the Society of Automotive Engineers (SAE), administers NADCAP. PRI was founded for the purpose of developing and advancing conformity assessment programs to raise special process and quality standards on an industry-wide basis while minimizing redundancy in auditing and generally improving the process.

Membership categories include subscribers, who are NADCAP users with voting privileges in all activities; government agency representatives, who have voting privileges in all activities; associate prime members, who can participate in meetings but have no voting privileges; and suppliers, who participate in developing and revising audit criteria and can vote on non-accreditation matters.

Processes for which task groups have been formed include aerospace quality systems, chemical processes, coatings, distributors, fluid system components, fasteners, heat treating, materials testing laboratories, nondestructive testing, sealants, welding, and the Fastener Quality Act, for which the National Institute for Standards and Technology (NIST) has found NADCAP to be in compliance for accreditation of fastener testing laboratories. PRI/NADCAP has its own Quality Manual that meets the intent of ISO 9001.

Although PRI staff auditors perform the audits, the task groups decide on the qualification requirements for the auditors and make the final decision on the contractor accreditation. All NADCAP AS9000 auditors must complete:

- ISO-9000 training (ISO certification as lead auditor not required)
- AS9000 training
- ISO-10011-2 requirements
 - Work experience: 4 years of full time experience, relative to auditing
 - Quality experience: minimum 2 years of quality-related experience
 - Auditing experience: minimum five audits within last 3 years

The Aerospace Quality System task group is discussing adding a requirement for all auditors to interview with the task group itself. Auditor qualification options include 1) certified by the RAB, 2) NADCAP (Aerospace Quality System) qualified to RAB criteria, or 3) NADCAP certified to NADCAP criteria.

b. NADCAP Memorandum of Understanding with AECMA-CERT

The European Association of Aerospace Industries (AECMA) comprises national aerospace associations of the United Kingdom, France, Belgium, Italy, Spain, and Sweden as well as the largest European aerospace companies. AECMA-CERT is an affiliated association to certify conformity to European standards (EN). The initial meeting between PRI/NADCAP and AECMA-CERT took place in Turin, Italy, in June 1995, with additional meetings following in March 1996. The memorandum of understanding (MOU), signed in September 1996, is to explore the potential for certification reciprocity. Once accomplished, reciprocity would mean that suppliers certified by NADCAP would be able to conduct business in Europe without duplicating the time-consuming and expensive audit process.

A meeting was held on 6 November 1997 to follow up on the MOU by outlining the concerns of AECMA-CERT and PRI/NADCAP members, defining the scope of work, chartering the coordinating group, and developing a joint communiqué to inform the aerospace industry of the work to date.

c. NADCAP Memorandum of Understanding with QUALIFAS

Like AECMA-CERT, the Quality of Procurements for French Aerospace Industries (QUALIFAS) also audits European companies to a variety of standards. The QUALIFAS and PRI/NADCAP have signed an MOU for evaluating each other's quality manuals and auditing and supplier approval processes. This process is ongoing.

C. STANAG 4107—MUTUAL ACCEPTANCE OF GOVERNMENT QUALITY ASSURANCE

The North Atlantic Treaty Organization (NATO) has a standardization agreement whereby NATO countries request and accept the quality assurance services⁶ of one another's designated quality authorities in order to assure the quality of military materiel and services produced in NATO countries. This agreement—STANAG 4107, Mutual Acceptance of Government Quality Assurance—details the terms and procedures for cooperation between NATO members to provide for the quality assurance of their defense suppliers.

⁶ STANAG 4107 defines Government Quality Assurance as "the process by which the appropriate national authorities establish competence that contractual requirements relating to quality are met."

The framework of STANAG 4107 provides a process through which a purchasing NATO country may request that the assigned authority in a manufacturing NATO country perform the required quality assurance services on its behalf. The NATO country in which the supplier resides, therefore, evaluates the contractor's quality assurance procedures to assure the purchasing NATO country that the contractor will produce and deliver quality products and services, which comply with contractual requirements. STANAG 4107 is used when the contract places a high priority on the verification of quality and stipulates that it must be done before the products or services are received.

The procedure for performing quality assurance services for another NATO country begins when the purchasing country submits a formal Request for Quality Assurance form to the appropriate authority in the manufacturing country. The initial request details the contract's specifications, drawings, and any additional quality requirements necessary to perform a quality assurance evaluation. The designated government authority in the manufacturing country assesses the supplier on the basis of the quality requirements indicated in the contract and makes the necessary provisions for any identified nonconformities to be corrected. If at any time the government authority in charge of performing quality assurance determines that a supplier is so deficient as to hinder further evaluation, the purchasing country will be informed of this status and provided with any data relating to the identified deficiencies. If a supplier's quality has been proven, however, the manufacturing government authority provides the purchasing country with a certificate of the supplier's conformity. Although the manufacturing country performs this quality assurance service on behalf of a purchasing country, the purchasing country reserves the right to visit a supplier at any point during a contract, as arranged through the manufacturing country's authority.

NATO countries may define their level of acceptance of STANAG 4107 in three ways: 1) ratification, 2) implementation, and 3) reservation. Ratification occurs when NATO countries indicate their acceptance of the standardization agreement's content. Implementation occurs when a NATO member country carries out its responsibilities as outlined in the standardization agreement. Finally, a NATO member country may note a reservation or stipulation that it cannot adhere to a particular part of the standardization agreement. The U.S. maintains a reservation that states that the quality assurance services performed by the U.S. government authority will not be free of charge unless previously negotiated in an agreement between the United States and the requesting NATO country.

As a rule, the government quality assurance service is provided without charge to the purchasing NATO country, as any expenses incurred are covered by the contracting parties. This quality assurance arrangement fosters a cooperative relationship between the two NATO countries' authorities with respect to quality and quality-related issues. The quality assurance that takes place is based not on one specific standard, but on various individual specifications as detailed in each contract. Each country must have a high level of cooperation and trust in the other's quality assurance capabilities since the purchasing country is entrusting its role of assuring the quality of its suppliers to the manufacturing country's authority. Therefore, it is important that each of the NATO countries' authorities convey their competence in conducting quality assurance services based not only on one standard's criteria, but also on the various requirements that pertain to any given contract.

D. CURRENT DOD POLICY

DoD policymakers have recognized that substantial costs are associated with supplier control and that routine supplier audits conducted independently by each prime contractor can be duplicative, repetitive, and costly. Dr. Paul Kaminski, in his speech "Standards and the Single Process," recognized NADCAP as a possible contribution to the single process initiative:

By significantly reducing redundant audits and multiple processes, costs and cycle time have been reduced by as much as 50 percent. Certainly, if industry can unite behind a single process standard and certification procedure, it makes a strong case for our consideration under the single process initiative.

The Office of Management and Budget (OMB) Circular 119, "Federal Participation in the Development and Use of Voluntary Consensus Standards and in Conformity Assessment Activities," is currently being revised to align with Public Law 104-113, the National Technology Transfer Act of 1995. Paragraph 11 of that revised document states:

Conformity Assessment. Section 12(b) of P.L. 104-113 requires NIST to coordinate Federal, State, and local standards activities and conformity assessment activities with private sector standards activities and conformity assessment activities, with the goal of eliminating unnecessary duplication and complexity in the development and promulgation of conformity assessment requirements and measures. To ensure effective coordination, NIST shall issue guidance to the agencies.

Such action should also enhance opportunities for reciprocal agreements among the federal agencies and with private organizations such as NADCAP and C.A.S.E. Some participation is already taking place. For example, the Defense Logistics Agency (DLA) holds a "Quality Day" every few months for its customers. During the October 1997 Quality Day, DLA also invited two members from C.A.S.E. to explain the benefits of the reduction in audits that their program can bring to the buying activities.

The Defense Contract Management Command (DCMC), which performs an oversight function in assessing the quality, technical, and production compliance of DoD contractors, has had a policy since 18 November 1996 that advises taking third party audit results into account when appropriate. Since that time, DCMC policy has stated that duplicative auditing efforts shall not be undertaken if data already exist to document that a contractor's quality meets a particular contract's quality requirements. "DCMC personnel shall evaluate contractor quality systems for compliance with contract requirements using existing data." General Drewes also issued DCMC Memorandum No. 97-37, "Management Council Reduction of Redundant Supplier Audits," which recognized both C.A.S.E. and NADCAP: "We welcome and applaud credible third party programs and industry efforts to self-control." This memo encourages DCMC personnel to work with contractors within their local management councils to actively look for ways to reduce or eliminate redundant prime contractor audits of suppliers, by relying on third party or industry approvals where feasible. When evaluating quality systems the policy directs that—

DCMC personnel shall evaluate contractor quality systems for compliance with contractor requirements using existing data (e.g., audit reports) from credible first, second, or third party audits.

The government's formal, documented policy is to avoid duplicating audits already performed when these audits and their auditors can be verified. DCMC, however, still requires a DCMC quality audit when—

- Data from a previous audit are inadequate or unavailable
- The customer specifically requests a DCMC audit
- There is an indication that a contractor's performance is not compatible with the contract requirements
- The contractor has undertaken major modifications of its quality system

Any audits undertaken by DCMC should be confined to those areas specifically identified by the customer as important to a contractor's quality compliance with a contract's requirements.

DCMC utilizes the ISO 9000 or ANSI/ASQ Q9000 series of standards in conducting its audits. DCMC auditors use a checklist of questions, based on the 20 criteria of ISO 9000, as a template to evaluate the quality systems of government contractors. When the DCMC audit is complete, the auditors present the audit results to the contractor and customer. If the contractor is not in compliance with the contract's quality management system criteria, the contractor is asked to implement corrective actions. Once all corrective actions (if any) have been made and the contractor is determined to be in compliance with the contract's quality requirements, the contractor is considered to be *qualified*.

DCMC encourages and benefits from the audit work of industry organizations such as C.A.S.E. and NADCAP because DCMC can often rely on their audit reports, thereby reducing or eliminating the need for a DCMC audit. To date, however, membership in these organizations is not yet widespread across all industry sectors. DCMC manages more than 360,000 prime contracts worth more than \$900 billion at more than 23,000 contractors throughout the world. Any substantial gains to the government from a relationship with these industry organizations is, therefore, hindered by their currently limited size and scope.

E. PROPOSAL BY GIQLP

The Government and Industry Quality Liaison Panel (GIQLP) consists of a number of members from participating government agencies and industry associations. Their goal is to advance quality practices and remove non-value added costs hidden in restrictive requirements and redundant oversight and inspection processes. The Panel has recommended a process for recognition and reciprocity in their recent document *Quality Management Systems Guide*.

Mutual Recognition of a Supplier Quality Management System. An on-site supplier quality management system assessment by one participating procuring activity or its agent should be recognized and accepted by the other procuring activities as adequate evidence that the system was found to comply with BQMS [Basic Quality Management System] criteria at that time. Multiple reviews and duplicate demands of a supplier or supplier by

several agencies should be reduced to the maximum practicable extent through assessment reciprocity or cross-servicing arrangements.

The one constant across government agencies or industry groupings that enables mutual recognition of a supplier's quality management system is a basic quality system based on the elements of ISO 9001. There may be further opportunity for mutual recognition within an agency or industry group of commonly agreed upon terms and conditions required of suppliers.

Reciprocity for Quality System Audits. To enable reciprocity and mutual recognition of a supplier's quality management system, at the conclusion of an on-site assessment each procuring activity or its agent will leave the supplier a copy of the assessment criteria (i.e., checklist) employed, the assessment results, and a statement of qualification of the performing assessors. Third party assessors will also be requested to provide similar information to the supplier.

Another procuring activity may then request of the supplier objective evidence of quality system assessments by other customers, agents, or third parties. The requesting customer will evaluate the prior assessment to determine suitability to satisfy assessment requirements. The customer may then consider the supplier's quality system to be qualified based on the evidence provided by the supplier, or determine that another or a partial assessment is required and then carry it out accordingly.

Advantage gained is based on a review of the documentation of the assessment performed, with the audit requirement determined to be fully satisfied and "signed-off" (full reciprocity) or that the assessment has partially satisfied requirements and a limited assessment will be performed (partial reciprocity). The customer always has the choice of accepting the validity of a previously performed audit, or doing a complete or partial audit of the supplier's quality management system

In this GIQLP definition, the essence of reciprocity and recognition is customers agreeing to honor each other's assessments and audit results. This definition is different from that used in this report and may not distinguish the two sufficiently or afford an opportunity to truly impact the subcontractor base assessment and audit process. We recognize that industry contractors are somewhat hesitant to recognize someone else's audits. Industry also would not want another bureaucratic government organization to coordinate the reciprocal audit process. This is why organizations such as C.A.S.E. and NADCAP are welcomed by DCMC policy.

VI. CONCLUSIONS AND RECOMMENDATIONS

A. STUDY RESULTS

There are many reasons why a supplier would want to win an award or become certified or registered to a standard. Foremost is the prospect of increased business opportunities. Most qualification programs work as thresholds—either the supplier meets the standard of the program required by the customer or the supplier doesn't do business with that customer. The prestige that comes with winning a quality award also usually results in new business in the commercial sector. For defense contracts, audits by DCMC to determine that the supplier meets an ISO-like system tailored to the needs of the contract are required. New acquisition rules now let DoD buying authorities consider the past performance of a contractor—quality, schedule, and cost performance—in source selection.

The problems with audits for a supplier come when different customers require different types of audits under different types of certification/registration/accreditation programs. Many of these audits are similar in nature and content, as illustrated by our comparison tables in Chapters II and III. Similarity among programs is a result of using the 20 elements of the ISO 9000 standards as their basis. But each audit costs the supplier and the customer substantial amounts of time and money. Data we collected shows that ISO 9000 registration alone can cost a company as much as \$30,000 initially and up to \$5,000 every 6 months for reassessment to maintain the registration.¹

Shared data bases and reciprocal agreements among companies in formal organizations such as C.A.S.E. and NADCAP have saved their member companies both time and money as the following examples illustrate. One C.A.S.E.-member company reports that it saves an average of 100 audit surveys per year. Each survey entails about 32 hours of labor and travel cost, which works out on average to \$5,000 per survey. A large prime contractor company reports net savings of \$1.6 million per year due to its

¹ Steven M. Terronez, "The Contractor Performance Certification Program," *Army RD&A*, Sept-Oct 1997.

NADCAP membership. Another prime reports savings of over 200 audits per year. NADCAP supplier companies report savings of about 40% fewer audits per year. Their business volume has increased \$750,000 to \$2 million.

Despite such reported savings, trust remains an issue for most primes—they prefer to do their own quality system audits rather than rely on those done by one of their competitors, and they worry about the legal repercussions of sharing their audit results of suppliers with other customers. C.A.S.E. members determined that their organization presents no legal liability, as demonstrated by the fact that it has operated for over 30 years without successful legal challenges. The trick is to have an arrangement whereby the participating original equipment manufacturers (OEMs) agree on the processes for the audits, the auditor qualifications, and the criteria for the audits (usually based on ISO-9000 with some sector-specific additions). Then the contractors can share nonprejudicial data on the process, completion, and pass-fail results of the audit without worrying about legal repercussions of sharing the actual audit results. This is the procedure C.A.S.E. uses and it has been lawsuit-free since its inception in 1964. C.A.S.E. was formed when several prime contractors who shared many of the same suppliers banded together to derive a process whereby they could reduce the number of audits and assessments they had to perform on their suppliers.

B. RECOMMENDATIONS

To reduce the time and cost of quality system audits, DoD would do well to make use of as much industry data and as many industry programs as possible. This has been DCMC policy since November 1996, and we recommend that DoD continue along this path. Because DoD cannot recommend one industry program over another, industry must make the determination of which reciprocal organization meets its needs. Since trust is best built among customers who share similar products, these organizations, or divisions and sections within the organizations, should be built around industry sectors, as the sections of C.A.S.E. and NADCAP are. Since DCMC deals with thousands of products that do not currently have reciprocal agreements and organizations within their sectors, its only option is to do its own audits under the current policy of using any other audit information available from the supplier. DoD would do well to encourage the defense and commercial industry to look at the benefits of forming reciprocal relationships for their quality audits. When such arrangements become best commercial practice, DoD can make full use of them. As with other processes under the Single Process Initiative, the

greatest benefit comes when streamlining practices not only affect prime contractors but also pervade the supplier base. We repeat here the recommendations of the gear industry report on the Common Quality Certification System (CQCS):

Finally, for a CQCS to be truly successful, it must be applicable at all supplier levels. Therefore, primes need to undertake efforts to reduce the redundancies and foster reciprocity in the auditing and certification of their own suppliers. Also, the primes need to agree on criteria and encourage reciprocity in the audit and certification of their suppliers, otherwise, a CQCS will provide inconsistent benefits to the industry as a whole.

Appendix A
QUALITY SYSTEM ASSESSMENT PROGRAM CRITERIA

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Appendix A

QUALITY SYSTEM ASSESSMENT PROGRAM CRITERIA

For each program in this appendix, criteria are listed in three categories—process criteria, auditor criteria, and results criteria. Process criteria are those attributes of the process one must go through to receive registration to a particular program or standard. Auditor criteria are the qualification requirements for the auditors of a specific program or standard. Results criteria are those characteristics against which the quality system is judged.

ISO 9000

Process Criteria

Preassessment Phase

- Company, consultant, or registration agency assesses the existing quality system
- Company designs, modifies, and/or implements a quality system that addresses ISO 9000 criteria

Assessment Phase

- Registration audit (comprehensive audit of the organization) performed by third party registration agency (registrar)
- Any cases of noncompliance are presented
- Third party registration agency may conduct additional audits/reviews to determine if nonconformance issues have been addressed
- Certificate of conformance to ISO 9000 standard presented to the company or organization

Postassessment Phase

- Periodic surveillance audits
- Certification generally expires in 3 years

Auditor Criteria

- Auditor must have completed a secondary education and possess demonstrated oral and written communication skills
- Auditor must have participated in training to ensure auditing competence based on a demonstrated understanding of the following: standards; examination, questioning, evaluation, and reporting techniques; and the skills necessary for managing an audit
- Auditor must have at least 4 years of full-time work experience, 2 of which involve quality assurance
- Auditor must gain experience in the auditing process by participating in at least 4 audits over a minimum of 20 days
- Auditor must be proven to possess personality attributes, including maturity, open-mindedness, solid judgment, analytical skills, tenacity, perceptiveness, the ability to comprehend complex situations from varying perspectives, and the ability to understand a single unit's role in the whole organization
- Auditor must demonstrate the knowledge and use of the management skills necessary in performing audits
- Auditors must have their competence in current quality system standards and the auditing process and methods reviewed through a performance review every 3 years, with training being prescribed as necessary

Results Criteria

1. Management responsibility
 - 1.1 Quality policy
 - 1.2 Organization
 - 1.2.1 Responsibility and authority
 - 1.2.2 Resources
 - 1.2.3 Management representative
 - 1.3 Management review
2. Quality system
 - 2.1 General
 - 2.2 Quality system procedures
 - 2.3 Quality planning
3. Contract review
 - 3.1 General
 - 3.2 Review
 - 3.3 Amendment to contract
 - 3.4 Records

- 4. Design control
 - 4.1 General
 - 4.2 Design and development planning
 - 4.3 Organizational and technical interfaces
 - 4.4 Design input
 - 4.5 Design output
 - 4.6 Design review
 - 4.7 Design verification
 - 4.8 Design changes
- 5. Document and data control
 - 5.1 General
 - 5.2 Document and data approval and issue
 - 5.3 Document and data changes
- 6. Purchasing
 - 6.1 General
 - 6.2 Evaluation of subcontractors
 - 6.3 Purchasing data
 - 6.4 Verification of purchased product
- 7. Control of customer-supplied product
- 8. Product identification and traceability
- 9. Process control
- 10. Inspection and testing
 - 10.1. General
 - 10.2 Receiving inspection and testing
 - 10.3 In-process inspection and testing
 - 10.4 Final inspection and testing
 - 10.5 Inspection and test records
- 11. Control of inspection, measuring and test equipment
 - 11.1 General
 - 11.2 Control procedure
- 12. Inspection and test status
- 13. Control of nonconforming product
 - 13.1 General
 - 13.2 Review and disposition of nonconforming product
- 14. Corrective and preventive action
 - 14.1 General
 - 14.2 Corrective action
 - 14.3 Preventive action
- 15. Handling, storage, packaging, preservation, and delivery
 - 15.1 General
 - 15.2 Handling

- 15.3 Storage
- 15.4 Packaging
- 15.5 Preservation
- 15.6 Delivery
- 16. Control of quality records
- 17. Internal quality audits
- 18. Training
- 19. Servicing
- 20. Statistical techniques
 - 20.1 Identification of need
 - 20.2 Procedures

BOEING D1-9000

Process Criteria

Preassessment Phase

- Assistance provided to supplier on how to interface with Boeing during D1-9000 approval process

Assessment Phase

- Initial qualification audit of suppliers' quality and production and control systems by the procurement quality assurance representatives
- Corrective actions implemented by the supplier if deficiencies are discovered
- Supplier conformity with Boeing specific requirements (i.e., quality and contract requirements; CAD system to use; and the execution of first article testing) ensured

Postassessment Phase

- Maintenance audits conducted by the procurement quality assurance representatives
- Follow-up on reports from Boeing and customers documenting any quality concerns

Auditor Criteria

- Procurement quality assurance representatives from Boeing

Results Criteria

Basic Quality System

1. Management responsibility
 - 1.1 Quality policy
 - 1.2 Organization
 - 1.2.1 Responsibility and authority
 - 1.2.2 Resources
 - 1.2.3 Management representative
 - 1.2.4 Management representative notification
 - 1.2.5 Delegated quality activities
 - 1.3 Management review
2. Quality system
 - 2.1 General
 - 2.2 Quality system procedures
 - 2.3 Quality planning
3. Contract review
 - 3.1 General
 - 3.2 Review
 - 3.3 Amendment to a contract
 - 3.4 Records
 - 4.1 Design authority
5. Document and data control
 - 5.1 General
 - 5.2 Document and data approval and issue
 - 5.3 Document and data changes
 - 5.3.1 Document change incorporation
6. Purchasing
 - 6.1 General
 - 6.1.1 Responsibility
 - 6.2 Evaluation of subcontractors
 - 6.3 Purchasing data
 - 6.4 Verification of purchased product
 - 6.4.1 Supplier verification at subcontractor's premises
 - 6.4.2 Customer verification of subcontracted product
 - 6.4.3 Delegation of supplier verification to subcontractors
 - 6.4.4 Right of entry
 - 6.5 Requirements flowdown
7. Control of customer—supplied product
 - 7.1 Notification and authorization
8. Product identification and traceability

- 9. Process control
 - 9.1 Process specification requirements
 - 9.2 Tooling
- 10. Inspection and testing
 - 10.1 General
 - 10.1.1 Approved inspection and test sources
 - 10.2 Receiving inspection and testing
 - 10.3 In-process inspection and testing
 - 10.4 Final inspection and testing
 - 10.4.1 Use of Boeing digital data sets as authority for design and/or inspection
 - 10.5 Inspection and test records
 - 10.5.1 First production article
 - 10.6 Inspection options
- 11. Control of inspection, measuring and test equipment
 - 11.1 General
 - 11.1.1 Definition
 - 11.2 Control procedure
- 12. Inspection and test status
 - 12.1 Inspection stamps
- 13. Control of nonconforming product
 - 13.1 General
 - 13.2 Review and disposition of nonconforming product
 - 13.2.1 Material review authority
 - 13.2.2 Regrading material
 - 13.2.3 Scrap material
 - 13.2.4 Material review of supplier designs
 - 13.2.5 Notification
- 14. Corrective and preventive action
 - 14.1 General
 - 14.1.1 Repetitive nonconformances
 - 14.2 Corrective action
 - 14.2.1 Corrective action response format
 - 14.3 Preventive action
- 15. Handling, storage, packaging, preservation and delivery
 - 15.1 General
 - 15.2 Handling
 - 15.3 Storage
 - 15.3.1 Configuration control of inventory
 - 15.3.2 Control of excess inventory
 - 15.4 Packaging
 - 15.5 Preservation

- 15.6 Delivery
 - 15.6.1 Shipping documents
- 16. Control of quality records
 - 16.1 Record retention and availability
- 17. Internal quality audits
 - 17.1 Annual audit
- 18. Training
 - 18.1 Proficiency assessment
- 19. Servicing
- 20. Statistical techniques
 - 20.1 Identification of need
 - 20.2 Procedures
 - 20.3 Acceptance sampling

Additional Criteria

Advanced Quality System

1. Determine key characteristics.¹ A Boeing supplier must incorporate key characteristics, whether identified by Boeing or through a supplier team analysis, into its Advanced Quality System (AQS) Control Plan. Furthermore, suppliers are required to "flowdown" key characteristics to subcontractors.
 - 1.1 Does Boeing provide key characteristics?
 - 1.2 Collect data to determine key characteristics
 - 1.3 Establish key characteristics
 - 1.4 Document key characteristics and engineering specifications on AQS control plan
2. Provide evidence of variation. Once key characteristics have been identified, the supplier must determine the most appropriate point in the manufacturing process and the tools to be used to take measurements. These measurements are recorded on a control chart in order to track a key characteristic's variation. Suppliers must record their control chart choice, the point in the process at which the measurements are taken, and the frequency with which the measurements are taken on their AQS Control Plan.
 - 2.1 Determine process steps where key characteristics are measured
 - 2.2 Select appropriate control charts
 - 2.3 Document process steps, control charts. Sample size, and frequency on AQS control plan
 - 2.4 Collect measurements and maintain control charts

¹ "A key characteristic is a feature whose variation has the greatest impact on the fit, performance, or service life of the finished product from the perspective of the customer," Boeing D1-9000.

3. Identify and control sources of variation. Suppliers are to use the measurements plotted on a control chart to determine whether a key characteristic is in control and calculate whether its capabilities are adequate to meet specific engineering specifications. If a key characteristic is discovered to be out of control, the supplier must identify the causes of variations and take action to eliminate these special, gage, and/or process variation causes. Once corrective actions have been made, new measurements must be taken and plotted in order to show that the key characteristic is once again in control. All data regarding the elimination of variations is recorded in the supplier's quality system documentation.
 - 3.1 Determine whether key characteristic is in statistical control
 - 3.2 Determine whether key characteristic meets minimum capability
 - 3.3 Assess whether special causes of variation can be assigned
 - 3.4 Remove special causes of variation
 - 3.5 Collect new measurements
 - 3.6 Verify whether gage variation study has been performed and documented
 - 3.7 Perform gage variation study and document results on AQS control plan
 - 3.8 Determine whether corrective action was taken on measurement system
 - 3.9 Identify potential sources of process variation
 - 3.10 Correlate sources of process variation with the key characteristic
 - 3.11 Establish controls for key process parameters
 - 3.12 Document operation, key process parameters, process parameter settings, and control method on AQS control plan
 - 3.13 Update process data base or historical records
4. Process orientation. If many different parts share the same key characteristics and processes, the supplier may wish to adopt a method of process control to minimize variation. To do so, a supplier must have a solid understanding of the relationship between process output and process input parameters, which must function in control.
 - 4.1 Process output control
 - 4.2 Process input control

AEROSPACE INDUSTRY AS-9000

Process Criteria

- Compatible with the ISO 9000 registration process

Auditor Criteria

- Dependent upon the validation process chosen

Results Criteria

1. Management responsibility
 - 1.1 Quality policy
 - 1.2 Organization
 - 1.3 Management review
2. Quality system
 - 2.1 General
 - 2.2 Quality system procedures
 - 2.3 Quality planning
3. Contract review
 - 3.1 General
 - 3.2 Review
 - 3.3 Amendment to contract
 - 3.4 Records
4. Design control
 - 4.1 General
 - 4.2 Design and development planning
 - 4.3 Organizational and technical interfaces
 - 4.4 Design input
 - 4.5 Design output
 - 4.6 Design review
 - 4.7 Design verification
 - 4.8 Design validation
 - 4.9 Design changes
5. Document and data control
 - 5.1 General
 - 5.2 Document and data approval and issue
 - 5.3 Document and data changes
6. Purchasing
 - 6.1 General
 - 6.2 Evaluation of subcontractors
 - 6.3 Purchasing data
 - 6.4 Verification of purchased product
 - 6.5 Requirements flowdown
7. Control of customer-supplied product
8. Product identification and traceability
9. Process control
 - 9.1 Process specification requirements
 - 9.2 Tooling
10. Inspection and testing
 - 10.1 General

- 10.2 Receiving inspection and testing
- 10.3 In-process inspection and testing
- 10.4 Final inspection and testing
- 10.5 Inspection and test records
- 11. Control of inspection, measuring and test equipment
 - 11.1 General
 - 11.2 Control procedure
- 12. Inspection and test status
 - 12.1 Acceptance authority media
- 13. Control of nonconforming product
 - 13.1 General
 - 13.2 Review and disposition of nonconforming product
- 14. Corrective and preventive action
 - 14.1 General
 - 14.2 Corrective action
 - 14.3 Preventive action
- 15. Handling, storage, packaging, preservation and delivery
 - 15.1 General
 - 15.2 Handling
 - 15.3 Storage
 - 15.4 Packaging
 - 15.5 Preservation
 - 15.6 Delivery
- 16. Control of quality records
 - 16.1 Record availability
- 17. Internal quality audits
- 18. Training
- 19. Servicing
- 20. Statistical techniques
 - 20.1 Identification of need
 - 20.2 Procedures
 - 20.3 Sampling inspection

AUTOMAKERS QS-9000

Process Criteria

Preassessment Phase

- Sharing of quality system information
- Supplier applies for QS-9000 certification and provides necessary documentation

Assessment Phase

- Registration audit by third party registrar
- Nonconformities outlined
- Series of audits by third party registrar to determine if nonconformities have been addressed
- Certificate of conformance to QS-9000

Postassessment Phase

- Surveillance audits every six months

Auditor Criteria

- Third party registrars
- Successful completion of QS-9000 and quality system assessment courses
- Registrars accredited for QS-9000 compliance by the RAB

Results Criteria

1. Management responsibility
 - 1.1 Quality policy
 - 1.2 Organization
 - 1.3 Management review
 - 1.4 Business plan
 - 1.5 Analysis and use of company-level data
 - 1.6 Customer satisfaction
2. Quality system
 - 2.1 General
 - 2.2 Quality system procedures
 - 2.3 Quality planning
3. Control review
 - 3.1 General
 - 3.2 Review
 - 3.3 Amendment to a contract
 - 3.4 Records
4. Design control
 - 4.1 General
 - 4.2 Design and development training
 - 4.3 Organizational and technical interfaces
 - 4.4 Design input
 - 4.5 Design output
 - 4.6 Design review

- 4.7 Design verification
- 4.8 Design validation
- 4.9 Design changes
- 5. Document and data control
 - 5.1 General
 - 5.2 Document and data approval and issue
 - 5.3 Document and data changes
- 6. Purchasing
 - 6.1 General
 - 6.2 Evaluation of subcontractors
 - 6.3 Purchasing data
 - 6.4 Verification of purchased product
- 7. Control of customer-supplied product
- 8. Product identification and traceability
- 9. Process control
 - 9.1 Process monitoring and operator instructions
 - 9.2 Preliminary process capability requirements
 - 9.3 Ongoing process performance requirements
 - 9.4 Modified preliminary or ongoing capability requirements
 - 9.5 Verification of job set-ups
 - 9.6 Process changes
 - 9.7 Appearance items
- 10. Inspection and testing
 - 10.1 General
 - 10.2 Receiving inspection and testing
 - 10.3 In-process inspection and testing
 - 10.4 Final inspection and testing
 - 10.5 Inspection and test records
- 11. Control of inspection, measuring and test equipment
 - 11.1 General
 - 11.2 Control procedure
 - 11.3 Inspection, measuring and test equipment records
 - 11.4 Measurement system analysis
- 12. Inspection and test status
- 13. Control of nonconforming product
 - 13.1 General
 - 13.2 Review and disposition of nonconforming product
 - 13.3 Control of reworked product
 - 13.4 Engineering approved product authorization

- 14. Corrective and preventive action
 - 14.1 General
 - 14.2 Corrective action
 - 14.3 Preventive action
- 15. Handling, storage, packaging, preservation and delivery
 - 15.1 General
 - 15.2 Handling
 - 15.3 Storage
 - 15.4 Packaging
 - 15.5 Preservation
 - 15.6 Delivery
- 16. Control of quality records
- 17. Internal quality records
- 18. Training
- 19. Servicing
- 20. Statistical techniques

Additional Criteria

Sector-Specific Requirements

- 1. Production part approval process. Suppliers to the Big 3 are required to prove their compliance, and that of their subcontractors, with the "Production Part Approval Process" manual.
 - 1.1 General
 - 1.2 Engineering change validation
- 2. Continuous improvement. Suppliers should establish an approach to continuous improvement whereby they can identify opportunities for improving quality and productivity and implement a methodology to foster continuous improvement.
 - 2.1 General
 - 2.2 Quality and productivity improvements
 - 2.3 Techniques for continuous improvement
- 3. Manufacturing capabilities. Suppliers should utilize teams to create the plans necessary to meet the standards of advanced quality planning. In particular, there should be a methodology in place to eliminate product nonconformities attributable to a design or process element, and to assist in the design, manufacture, and inspection of the tools and gages required by the tooling system.
 - 3.1 Facilities, equipment, and process planning and effectiveness
 - 3.2 Mistake proofing

- 3.3 Tool design and fabrication
- 3.4 Tooling management

Customer-Specific Requirements

1. Chrysler—specific requirements

- 1.1 Third party registration required. By 31 July 1997, all of Chrysler's suppliers are to be third party QS-9000 verified.
- 1.2 Parts identified with symbols. Supplier parts are to be marked with specific symbols when they contain and/or represent safety characteristics, special characteristics, and critical tooling requirements.
- 1.3 Significant characteristics. Suppliers may also identify and label additional characteristics that they deem relevant to the production of a quality product or service.
- 1.4 Annual layout. Layout inspections must be performed for suppliers on an annual basis in order to confirm that a supplier remains in compliance with Chrysler requirements.
- 1.5 Internal quality audits. Suppliers must conduct annual internal audits of their quality.
- 1.6 Design validation/production verification. Suppliers' products must be verified/validated with regard to their design and production every model year.
- 1.7 Corrective action plan. Suppliers are to document on a specific Chrysler form all nonconformities and any resulting corrective actions made.
- 1.8 Packaging, shipping and labeling. Chrysler maintains in its manuals on packaging, shipping, and labeling, a specific set of instructions that is to be adhered to by suppliers.
- 1.9 Process sign-off. An advance quality planning team is required to perform a formal sign-off to indicate a supplier's process readiness to manufacture a new product.
- 1.10 Lot acceptance sampling table. Chrysler provides suppliers with a table to be used to determine lot acceptance, given specific characteristic classifications.

2. Ford—specific requirements

- 2.1 Third party registration not required. Ford suppliers are currently not required to obtain third party verification to QS-9000.
- 2.2 Control item parts. When characteristics related to safety and conformance with government regulations are identified, suppliers use standard symbols to record them on drawings and document them and any revisions in the Control Plan. Ford guidelines also regulate the use of the control item part's symbol with regard to packaging.

- 2.3 Critical characteristics. Characteristics that have been determined to influence the safety or government compliance of a product or service are included on the Control Plan, along with any special assembly, shipping, and monitoring requirements.
- 2.4 Set-up verification. The set-up of critical characteristics are to be ensured through statistical methods.
- 2.5 Control item fasteners. With regard to fasteners, suppliers must possess a system of control in analyzing metals for their hardness and composition and ensuring that fastener lots are traceable.
- 2.6 Heat treating. Ford guidelines are used to evaluate suppliers' characteristics for heat treating.
- 2.7 Process changes and design changes for supplier-responsible designs. If a supplier would like to make a modification on a Control Item Part, Ford must first review change information and grant its approval.
- 2.8 Supplier modification of control items and requirements. Control Plan revisions require previous Ford approval.
- 2.9 Engineering specification test performance requirements. Suppliers are required to use engineering specification testing to test if their design goals are being attained. If not, product shipments are to be halted and customers notified, until the appropriate corrective action has taken place and been verified.
- 2.10 System design specification. Suppliers should evaluate customer needs to identify those characteristics for measure within their systems.
- 2.11 Ongoing process monitoring. Ford details how a supplier should determine the disposition of a product when it has been produced while being monitored through statistical process control.
- 2.12 Prototype part quality initiatives. If prototypes are being produced, the supplier must have an established methodology for evaluating these prototypes and how their production experience may be used in planning the production process.
- 2.13 QOS. Suppliers are required to use Ford's Quality Operating System (QOS) methodology in the use of certain tools and practices, in order to extract increasing levels of customer satisfaction.
- 2.14 Qualification and acceptance criteria for materials. To qualify materials initially, suppliers will follow the appropriate material specification requirements. Subsequent material qualifications are to correspond to the methods documented and approved in the supplier's Control Plan.

3. General Motors—specific requirements

- 3.1 Third party registration required. By 31 December 1997, General Motors' suppliers are to be QS-9000 registered.
- 3.2 General procedures and other requirements. General Motors' suppliers are required to adhere to a number of additional requirements in General Motors' publications that include: "Key Characteristic Designation System;" "Supplier Submission of Material for Process Approval;" "Component Verification & Traceability Procedure;" etc.
- 3.3 QS-9000 applies to all General Motors suppliers. All suppliers to General Motors are subject to the criteria requirements of QS-9000.
- 3.4 Customer approval of control plans. General Motors' European suppliers are waived from having to obtain approval of their Control and Reaction Plans.
- 3.5 UPC labeling for commercial service applications. General Motors sometimes requires that suppliers use UPC, rather than AIAG, labeling.
- 3.6 Layout inspection and functional test. General Motor establishes no set frequency at which the customer is to inspect the supplier.

ARMY-CONTRACTOR PERFORMANCE CERTIFICATION PROGRAM

Process Criteria

Preliminary Phase

- MSC provides an introductory (CP)2 briefing to the contractor who has expressed interest
- Contractor's senior representative formally submits a letter of intent to enter the (CP)2

Preassessment Phase

- Candidate contractor provides information on its government contracts, facilities and organizational structure
- All MSCs, with which the contractor does and has done business, invited to participate in the assessment process
- Contractor and MSC determine the type of certification sought (i.e., production, design/development or production and design/development)
- MSCs confer to define the entities that are to be certified

- Past performance data collected from the contractor's customers
- Contractor uses (CP)2 "results criteria" to perform a self-assessment

Assessment Phase

- Baseline assessment and resulting report produced by the formal assessment team
- Contractor requests additional assessments as confirmation that suggested corrective actions have been implemented
- All MSC concerns addressed prior to certification
- At least a baseline and final assessment must take place
- Memorandum agreement between government and contractor detailing the scope, responsibilities and commitments of the contractor's certification
- Zero to ten scoring system with which to assess the contractor against the 28 certification criteria
- Preliminary through the completion of the assessment phase can take over 2 years

Postassessment Phase

- After 3 years of certification, a determination is made as to whether a full or partial assessment is needed for certification extension
- Contractor provides annual review reports on management and the program
- MSC follows up on any customer complaints
- MSC contacts contractor if any quality problems exist
- MSC may require a full assessment at any time if there have been major changes, a decline in quality improvements, etc.
- Decertification possible for unethical/illegal activities or the failure to implement required corrective actions

Auditor Criteria

- Behavior—high ethical standards; objectivity; sufficient knowledge for credibility; and flexibility in dealing with busy demands of those being reviewed
- Teamwork—work effectively with the personnel of the contractor being assessed; and promote the concept of working toward the same objective

- Communications—skillful at presenting ideas and recommendations; ability to keep an open mind; strong listening skills; and avoid making judgments before all information is understood
- Persuasion—present persuasive case for the contractor's need to make corrective actions
- Qualifications—formal education in assessment techniques and quality standards; and possess ASQC certification or RAB registration accreditation.

Results Criteria

1. Management responsibility
2. Quality system
3. Contract review
4. Design control
5. Document and data control
6. Purchasing
7. Control of customer—supplied product
8. Product identification and traceability
9. Process control
10. Inspection and testing
11. Control of inspection, measuring, and test equipment
12. Inspection and test status
13. Control of nonconforming product
14. Corrective and preventive action
15. Handling, storage, packaging, preservation and delivery
16. Control of quality records
17. Internal quality audits
18. Training
19. Servicing
20. Statistical techniques
21. Customer satisfaction. Contractors' employees at all levels must be aware of who the customers are and there should be a formal system whereby customers may communicate with the contractor and/or voice any concerns.
22. Quality costs. Contractors are to maintain documentation on the costs they incur due to their quality system and its relationship to total costs.

23. Warranty performance. A system is required for processing warranties and ensuring that appropriate corrective measures are being made by the contractor.
24. Ethics. A contractor must have an established ethical standard of conduct, which is openly communicated to employees and customers and contains specific reference to any government business dealings.
25. Business planning. The contractor is to use short- and long-term business planning with an ongoing focus on improvements in order to design, implement, and evaluate its business strategy.
26. Safety. A contractor is required to possess a safety process that: 1) is communicated to all employees; 2) includes the necessary protective equipment for employees; 3) provides employees with a mechanism to report safety violations; and 4) adheres to all federal, state, and local safety regulations.
27. Environmental. Contractors need to demonstrate their possession of a process for environmental compliance, which outlines the process for controlling hazardous materials, allows employees to report environmental violations, and adheres to all federal, state, and local environmental regulations.
28. Continuous improvement program. A contractor is required to have a documented policy for a continuous improvement process, which is administered at the senior management level. This process includes the setting of short- and long-term goals and the suggestion of specific metrics to be used to measure trends.

FAA-AIRCRAFT CERTIFICATION SYSTEMS EVALUATION PROGRAM

Process Criteria

- Evaluation conducted by evaluator team
- Team leader prepares report and forwards to the manufacturing inspection office
- Report then given to the principal inspector in charge of the facility
- Post-evaluation conference held with the facility's management and issues, results, and findings are reviewed
- Principal inspector responsible for surveillance of facility in the event of formal corrective actions
- Evaluation data entered into the ACSEP data base

Auditor Criteria

- Auditors selected on the basis of educational and experiential criteria
- Evaluator training through FAA Academy and Aircraft Certification Service (AIR) instructors who are experienced evaluation team leaders

- Mandatory participation in a minimum number of ACSEP evaluations as a trainee
- Teams consist of personnel from FAA engineering, flight test, and manufacturing inspection

Results Criteria

Major Systems

1. Quality
2. Engineering
3. Communications with the FAA
4. Manufacturing
5. Service and product
6. Management

Subsystems

1. Organization and responsibility
2. Design data control
3. Software quality assurance
4. Manufacturing processes
5. Special manufacturing processes
6. Statistical quality control
7. Nonconforming material
8. Material handling and storage
9. Nondestructive inspection
10. Tool and gauge
11. Testing
12. Internal audit
13. Global production
14. Supplier control
15. Airworthiness determination
16. FAR reporting requirements
17. Manufacturing maintenance facility

DSCC—QUALIFIED MANUFACTURER'S LIST

Process Criteria

- Specification and its qualification requirements presented to industry
- Manufacturer requests qualification for the specification
- Manufacturing facilities audit is performed by government employees
- Qualification examination and testing specific to the specification
- Manufacturer notified as to the results of testing (if qualification testing was passed, then the letter details the processes and materials to be placed on the specification's QML, otherwise the letter provides a detailed explanation as to the qualification testing failed)
- Letter of notification
- At time of 2-year review of qualification, the manufacturer must: 1) certify its qualification; 2) submit to periodic re-testing; or 3) undertake a complete requalification process

Auditor Criteria

Not specified

Results Criteria

Criteria vary according to a specification's qualification requirements.

DISC—QSLD/QSLM

Process Criteria

Preassessment Phase

- Supplier requests application form and criteria/provisions from DISC
- Supplier must possess a quality program that meets program criteria, a single quality control program and a CAGE code
- Supplier submits application including its quality manual

Assessment Phase

- DISC evaluates application against specific program criteria
- DISC assesses any of the supplier's recent government and industry surveys/audits to determine if a facility site visit is necessary
- DISC performs site surveys to review the quality control program and systems in place with regard to criteria
- If noncompliance is discovered, DISC issues a Letter-Note of Denial of Qualification, which cites the reasons for denial and may outline corrective actions to be taken for qualification approval
- Once compliance is determined, DISC issues a Letter-Notice of Qualification to the supplier

Postassessment Phase

- DISC conducts periodic announced and unannounced post-award audits to reaffirm compliance with program criteria
- Post-award audits include the independent lab testing of a random sampling of the supplier's product
- Qualification lapses in 3 years with a requalification application required 120 days prior to expiration

Auditor Criteria

- Site surveys and audits conducted by DISC agents

Results Criteria

The specific results criteria vary depending upon the QSLD/QSLM program in question. The following are several examples of these types of criteria for the various QSLD/QSLD programs:

Bulk Metals QSLD

- 3.1 Management responsibility
- 3.2 Document control
- 3.3 Purchasing
- 3.4 Product traceability
- 3.5 Process control

- 3.6 Inspection of material receipts
- 3.7 Test control
- 3.8 Test and measurement equipment
- 3.9.1 Non-conforming material
- 3.9.2 Corrective action
- 3.10 Storage, packaging and shipping
- 3.11 Records control
- 3.12 Audits
- 3.13 Personnel training

Class 3 Threaded Fasteners QSLD

- 3.1 Management responsibility
- 3.2 Document control
- 3.3 Purchasing
- 3.4 Product traceability
- 3.5 Lot control and marking
- 3.6 Inspection of material
- 3.7 Test control
- 3.8 Test and measurement equipment
- 3.9.1 Non-conforming material
- 3.9.2 Corrective action
- 3.10 Storage, packaging, and shipping
- 3.11 Records control
- 3.12 Audits
- 3.13 Personnel training
- 3.14 Products

Class 3 Threaded Fasteners QSLM

- 3.1 Management responsibility
- 3.2 Document control
- 3.3 Purchasing
- 3.4 Product traceability
- 3.5 Lot control and marking

- 3.6 Process control
- 3.7 Inspection of material
- 3.8 Test control
- 3.9 Test and measurement equipment
- 3.10.1 Non-conforming action
- 3.10.2 Corrective action
- 3.11 Storage, packaging, and shipping
- 3.12 Records control
- 3.13 Audits
- 3.14 Personnel training
- 3.15 Products

Appendix B
QUALITY AWARD CRITERIA

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Appendix B

QUALITY AWARD CRITERIA

MALCOLM BALDRIGE NATIONAL QUALITY AWARD

1. Process Criteria

- Application independently reviewed by six examiners and panel of judges determines who goes forward
- Application jointly reviewed by at least six examiners and panel of judges determines who goes forward
- Site visits by at least five examiners and one senior examiner and site report submitted to the panel of judges
- Final review and recommendations made by the panel of judges
- Award recipients determination made by the Secretary of Commerce
- Three-dimensional scoring system (approach, deployment, and results)
- Five-level scoring guidelines
- Feedback report for every nominee

2. Auditor Criteria

- Must apply annually
- Breadth of experience
- Diversity of experience
- Leadership and external representation
- Knowledge of business, specialized areas or quality practices and improvement strategies
- Two references
- 3-day preparation course
- 20- to 40-hour case study evaluation

- 50 senior examiners selected from annual examiner pool by Secretary of Commerce
- Nine members of the panel of judges selected from annual examiner pool by the Secretary of Commerce

3. Results Criteria

The numbers in parentheses after the category are the number of points allocated to that category.

- Leadership (110)
 - Leadership system (80)
 - Company responsibility and citizenship (30)
- Strategic planning (80)
 - Strategy development process (40)
 - Company strategy (40)
- Customer and market focus (80)
 - Customer and market knowledge (40)
 - Customer satisfaction and relationship enhancement (40)
- Information and analysis (80)
 - Selection and use of information and data (25)
 - Selection and use of comparative information and data (15)
 - Analysis and review of company performance (40)
- Human resource development and management (100)
 - Work systems (40)
 - Employee education, training and development (30)
 - Employee well-being and satisfaction (30)
- Process management (100)
 - Management of product and service processes (60)
 - Management of support processes (20)
 - Management of supplier and partnering processes (20)

- Business results (450)
 - Customer satisfaction results (130)
 - Financial and market results (130)
 - Human resource results (35)
 - Supplier and partner results (25)
 - Company specific results (130)

DEMING APPLICATION PRIZE OF THE JAPANESE UNION OF JAPANESE SCIENTISTS AND ENGINEERS

1. Process Criteria

- Applicants self-nominate by addressing the award criteria and providing an additional status report
- Application reviewed by the application prize subcommittee with results forwarded to the chair of the Deming prize committee
- Applicants may deliver a one-hour briefing to the evaluating subcommittee
- At least two examiners conduct “on-the-spot” survey of those nominees designated by the committee
- Application prize subcommittee presents a report of recommendations
- Deming prize committee makes final award decisions

2. Auditor Criteria

- Deming prize committee members, who are from industry, media, and the government, are unpaid appointees by the chair (president of the JUSE)

3. Results Criteria

- Company’s policy
- Organization and its management
- Education and dissemination
- Implemental conditions
 - The collection, transmittal and eventual utilization of quality information
 - Analysis
 - Standardization

- Control
- Effect
- Future planning

PRESIDENT'S AWARD FOR QUALITY AND PRODUCTIVITY IMPROVEMENT

1. Process Criteria

- Application reviewed by government agency before submission to OPM
- Preliminary review by OPM to ensure applicant's eligibility
- Applications reviewed jointly by examiner teams and selections made for site visits
- Site visit review by an examiner team and report submitted to the panel of judges
- Panel of judges conducts the final review and makes recommendations to the OPM
- The president makes final decision on award recipients
- Three-dimensional scoring system (approach, deployment, and results)
- Five-level scoring guidelines
- Feedback report for every nominee

2. Auditor Criteria

- Examiners represent public and private sector organizations

3. Results Criteria

The number in parentheses after the category is the number of points allocated to that category.

- Leadership (120)
 - Senior executive leadership (60)
 - Leadership system and organization (30)
 - Public responsibility and corporation citizenship (30)

- Information and analysis (75)
 - Management of information and data (20)
 - Competitive comparisons and benchmarking (15)
 - Analysis and use of organization-level data (40)
- Strategic planning (55)
 - Strategy development (35)
 - Strategy deployment (20)
- Human resource development and management (140)
 - Human resource planning and evaluation (20)
 - High performance work systems (45)
 - Employee education, training, and development (50)
 - Employee well-being and satisfaction (25)
- Process management (140)
 - Design and introduction of products and services (40)
 - Process management: product and service production and delivery (40)
 - Process management: support services (30)
 - Management of supplier performance (30)
- Business results (220)
 - Product and service quality results (65)
 - Organization operational and financial results
 - Human resource results (30)
 - Supplier performance results (25)
- Customer focus and satisfaction (250)
 - Customer knowledge (30)
 - Customer relationship management (30)
 - Customer satisfaction determination (30)
 - Customer satisfaction results (160)

GEORGE M. LOW AWARD: NASA'S QUALITY AND EXCELLENCE AWARD

1. Process Criteria

- Nominations are presented by the NASA centers
- NASA strategic enterprise GML review council screens nominees and forwards 10 finalists
- GML validation board evaluates supplemental responses, performs site visits, and recommends recipients
- GML panel of judges selects winner(s)
- Winner(s) are approved by the NASA administrator

2. Auditor Criteria

- Strategic enterprise review council: 4 members representing the strategic enterprises (determined through evaluation process by the enterprise quality council and endorsed by their enterprise associate administrators)
- Validation board: 5-member board composed of 3 strategic enterprise representatives and 2 representatives from the headquarters office
- Panel of judges: 3 judges—2 members from the strategic enterprises and 1 associate administrator

3. Results Criteria

The number in parentheses after the category is the number of points allocated to that category.

- NASA contract performance and customer satisfaction (300)
 - Contract technical performance and outcomes (200)
 - Customer knowledge, relationships, and value (100)
- NASA schedule (150)
- NASA cost (150)
- Long-term organizational initiatives to respond to NASA's strategic aspirations (100)
 - Strategic planning (50)
 - Long-term research and development (50)

- Leadership and continuous improvement (100)
- Innovative management and technology breakthroughs (100)
- Items of special interest to NASA (100)

SHIGEO SHINGO PRIZE FOR EXCELLENCE IN MANUFACTURING

1. Process Criteria

- Nominee "achievement reports" evaluated individually and jointly by board of examiner members
- Site verifications conducted by teams of 5 or 6 examiners
- Board of examiners recommends recipients to Shingo Prize council
- Shingo Prize council ratifies recommendations
- Feedback reports for every nominee
- Two-dimensional evaluation (strategy/implementation and results)
- Four-level scoring guidelines

2. Auditor Criteria

- Board of Examiners are practitioners and academicians with knowledge of manufacturing improvement methods, systems, processes and research
- Examiners represent leading business, government and professional agencies, and academics
- Shingo Prize provides training for examiner preparation

3. Results Criteria

The number in parentheses after the category is the number of points allocated to that category.

- Total quality and productivity management culture and infrastructure (275)
 - Leading (100)
 - Empowering (100)
 - Partnering (75)

- Manufacturing strategy, processes, and systems (425)
 - Manufacturing vision and strategy (50)
 - Manufacturing process integration (125)
 - Quality and productivity methods integration (125)
 - Manufacturing and business integration (125)
- Measured quality and productivity (200)
 - Quality enhancement (100)
 - Productivity improvement (100)
- Measured customer service (100)
 - Customer satisfaction (100)

Appendix C
ISSUES AND CONSIDERATIONS

Contributed by Sharon Fiore

Appendix C

ISSUES AND CONSIDERATIONS

When considering recognition or reciprocal concepts in lieu of a full customer oversight effort, buyers have to establish their confidence in the value of another buyer's oversight. In doing this, some very important factors must be considered.

1. Certification Process Management

- Does the certifier use audit plans and, if so, how thorough is the audit plan?
- Do the audit reports indicate that the audit plan was followed? Are the audit reports well written and do they contain valuable information?
- What is the frequency of internal audits?
- How timely are audits closed out?
- What is the follow-up procedure and how effective is the corrective action?
- How many corrective actions were issued during the certification process, and how long did the contractor take to make the corrections?
- Are the audit records traceable and recoverable?
- How effectively are metrics used to measure the potency of internal audits?
- What is required for the contractor to maintain certification?
- How often is a contractor reaudited for recertification?
- How extensive is the reaudit process? Full scope or partial?
- Is there a process in place to revoke certification of suppliers or contractors who fail to maintain the standards of certification above ISO 9000? If so, how many organizations have lost their certification and under what conditions?

2. Auditor Qualification

- What are the minimum qualifications required to become an auditor? Consider: education; training; work experience; quality experience; auditing experience.

- Are the auditors ISO-certified, or just qualified? Are they certified to another program's criteria, such as NADCAP?
- Have the auditors passed a RAB approved exam?
- Does the certifying organization conduct personal interviews with the auditors prior to accepting them?
- What are the requirements for auditors to maintain their competence and thereby maintain their status?
- Under what conditions would an auditor lose his or her certification?

3. Certification Results Criteria

- Does the program evaluate management effectively?
 - Communication of quality policy to all levels
 - Existence of policy and guidance for all quality improvement efforts
 - Allocation of resources to support continuous improvement
 - Management review of quality program
 - Teaming activities reporting results to management
- Does the certifier adequately assess the contractor's risk management ability?
- What importance is given to the determination and use of critical characteristics?
- How well does the certifier assess the contractor's ability to assure that all levels of the organization are aware of who their customers are--internal and external?
- Are the continuous improvement process criteria evaluated?
- What metrics does the certifier employ to assess the quality management system? Are they sufficient?
- How extensively does the certifier use other metrics, such as the accomplishment of predicted schedule/costs/operations and support costs, or the success rate in solving the problems with vital parts/subsystems?
- What methodology is used by the certifier to evaluate the existence and effectiveness of supplier empowerment and the customer/supplier partnership?

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Appendix F
DEFINITIONS FROM ISO GUIDE, *STANDARDIZATION AND*
RELATED ACTIVITIES—GENERAL VOCABULARY

Appendix F

DEFINITIONS FROM ISO GUIDE, *STANDARDIZATION AND RELATED ACTIVITIES--GENERAL VOCABULARY*

Conformity assessment. Any activity concerned with determining directly or indirectly that relevant requirements are fulfilled.¹

Registration. Procedure by which a body indicates relevant characteristics of a product, process or service, or particulars of a body or person, in an appropriate, publicly available, list.

Accreditation. Procedure by which an authoritative body gives formal recognition that a body or person is competent to carry out specific tasks.

Reciprocity. Bilateral relationship where both parties have the same rights and obligations towards each other.²

Certification. Procedure by which a third party gives written assurance that a product, process, or service conforms to specified requirements.

Recognition arrangement. Agreement that is based on the acceptance by one party of results, presented by another party, from the implementation of one or more designated functional elements of a conformity assessment system.³

¹ Typical examples of conformity assessment activities are sampling, testing and inspection; evaluation, verification, and assurance of conformity (supplier's declaration, certification); registration, accreditation, and approval as well as their combinations.

² Reciprocity can exist within a multilateral arrangement comprising a network of bilateral reciprocal relationships.

Though rights and obligations are the same, opportunities emanating from them may differ; this may lead to unequal relations between parties.

³ Typical examples of recognition arrangements are testing arrangements, inspection arrangements, and certification arrangements.

Recognition arrangements may be established at national, regional, or international level.

An agreement limited to declaration of equivalence of procedures without acceptance of results does not meet the above definition.

Appendix G
ACRONYMS

Appendix G

ACRONYMS

AAQG	American Aerospace Quality Group
ACSEP	Aircraft Certification Systems Evaluation Program
AECMA	European Association of Aerospace Industries
AMC	Army Materiel Command
ANSI	American National Standards Institute
AQP	Advanced Quality Practices
AQS	Advanced Quality System
ASQ	American Society for Quality
BQS	Basic Quality System
CAGE	Commercial and Government Entity Code
C.A.S.E.	Coordinating Agency for Supplier Evaluation
CDD	Contract Delivery Data
CES	Contractor Evaluation System
(CP)2	Contractor Performance Certification Program
CPARS	Contractor Performance Assessment Reporting System
CQCS	Common Quality Certification System
DARS	Defense Acquisition Regulation Supplement
DISC	Defense Industrial Supply Center
DLA	Defense Logistics Agency
DMS	Depot Maintenance System
DoD	Department of Defense
DRS	Deficiency Reporting System
DSCC	Defense Supply Center Columbus
EN	European Standards
FAA	Federal Aviation Administration
FAR	Federal Acquisition Regulation

FSC	Federal Supply Classification
GIQLP	Government and Industry Quality Liaison Panel
GML	George M. Low Award
GV/BB	Greatest Value/Best Buy
HMO	Health Maintenance Organization
IDA	Institute for Defense Analyses
INFAC	Instrumented Factory for Gears
IPDS	Integrated Product Development System
IPT	Integrated Product Team
ISO	International Organization for Standardization
MIR	Material Inspection Records
MOA	Memorandum of Agreement
MSC	Major Subordinate Command
MOU	Memorandum of Understanding
NADCAP	National Aerospace and Defense Contractors Accreditation Program
NAM	National Association of Manufacturers
NAP	National Accreditation Program
NASA	National Aeronautics and Space Administration
NATO	North Atlantic Treaty Organization
NAVSEA-LOGCENDET-PTSMH	Naval Sea Logistics Center Detachment Portsmouth
NCOA	National Committee for Quality Assurance
NGCAD	Northrop Grumman Commercial Aircraft Division
NIST	National Institute for Standards and Technology
NMQAO	Naval Material Quality Assessment Office
NSN	National Stock Numbers
OEM	Original Equipment Manufacturer
OPM	Office of Personnel Management
PCTSS	Provisioning and Categorizing Technical Support System
PDREP	Product Deficiency Reporting and Evaluation Program
PPI	Past Performance Information

PQDR	Product Quality Deficiency Report
PSP	Preferred Supplier Process
QML	Qualified Manufacturer's List
QMS	Quality Management System
QPL	Qualified Parts List
QSLD	Qualified Supplier List for Distributors
QSLM	Qualified Suppliers List for Manufacturers
QUALIFAS	Quality of Procurements for French Aerospace Industries
RAB	Registrar Accreditation Board
ROD	Reports of Discrepancy
RYG	Red/Yellow/Green Program
SAC	Supplier Audit Confirmation
SAC	Supplier Audit confirmation
SCS	Stock-Control System
SPS	Standard Procurement System
TDR	Transportation Discrepancy Report
TEA	Technical Evaluation Adjustment
WBOC	Women Business Owners Corporation

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